July 1962

culture

SELECTED CONTENTS

Irrigating Grassland . . . . . *J. S. Morrey*

Rotary Cultivation . . . . . *H. J. Hine*

Cow Cubicles . . . . . *Alec Calder*

Hypomagnesaemia and Fertilizers . . . . . *C. H. Mudd*

Sheep Enterprise . . . . . *P. G. James*

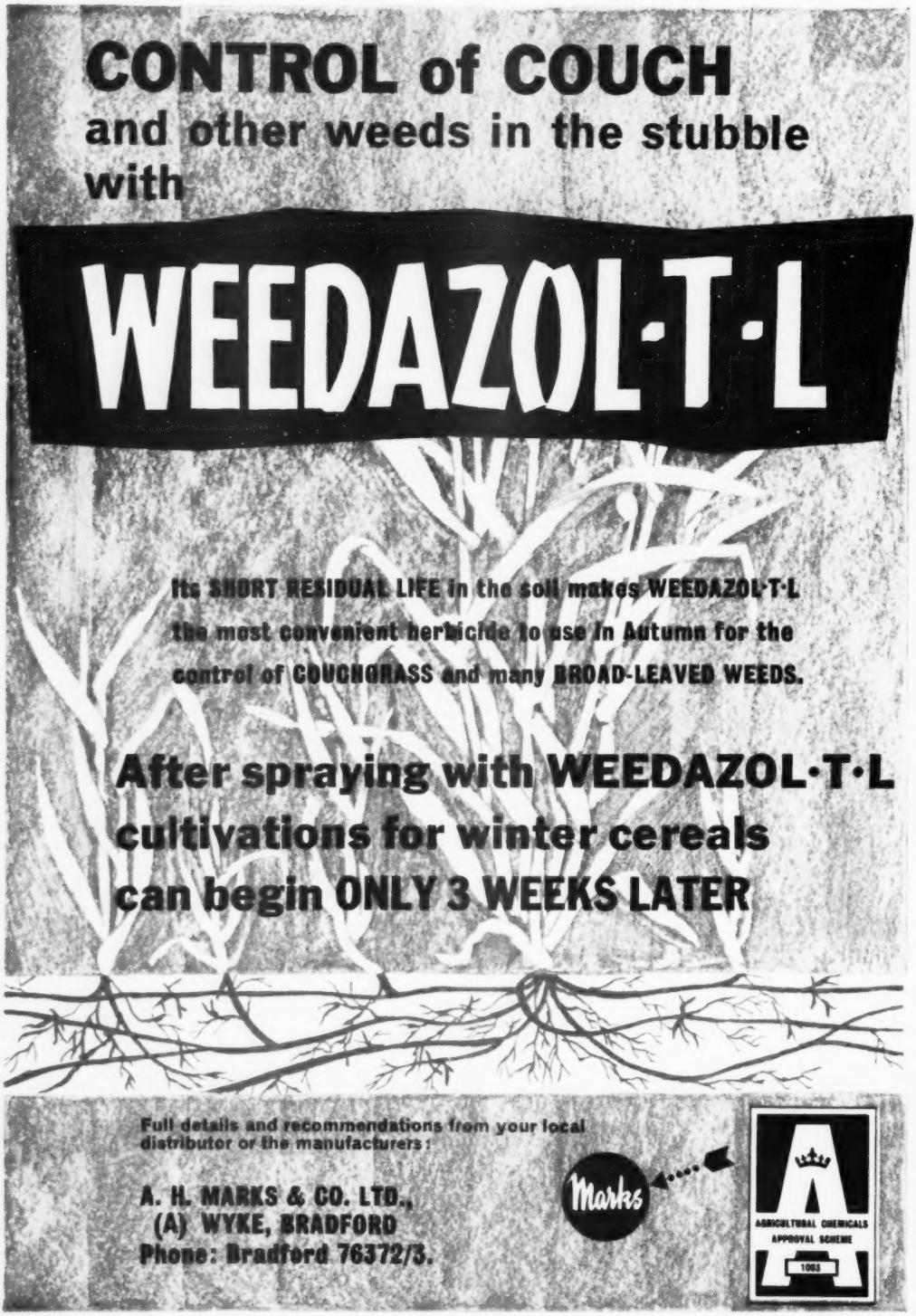
The Changing Pattern of Coccidiosis . . . *S. F. M. Davies*

Pioneers of Modern British Farming: Arthur Hosier *Lindsey G. Troup*

Celery Leaf Spot and New Seeds Legislation . . . *P. D. Hewett*

Published for the Ministry of Agriculture, Fisheries and Food by Her Majesty's Stationery Office

1s. MONTHLY


CONTROL of COUCH
and other weeds in the stubble
with
WEEDAZOL·T·L
Its SHORT RESIDUAL LIFE in the soil makes WEEDAZOL·T·L
the most convenient herbicide to use in Autumn for the
control of COUCHGRASS and many BROAD-LEAVED WEEDS.
After spraying with WEEDAZOL·T·L
cultivations for winter cereals
can begin ONLY 3 WEEKS LATER
Full details and recommendations from your local
distributor or the manufacturers:
A. H. MARKS & CO. LTD.,
(A) WYKE, BRADFORD
Phone: Bradford 76372/3.
Marks
AGRICULTURAL CHEMICALS
APPROVAL SCHEME
1963

TAS/MK62

'Sources of Finance for Farmers 1961-62'

has been written by Barclays Bank,
in consultation with the Ministry of Agriculture,
for the assistance of farmers
and others interested in agricultural finance.
Copies, which are of course
free of charge, may be obtained from
any branch of the Bank.

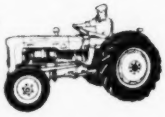
3

FORDSON SUPER DEXTA (39½ bhp.) The new powerful light tractor giving faster, more efficient work, matched to the power needs of modern p.t.o.-driven implements.

TRACTOR

FORDSON

FORDSON DEXTA (32 bhp). The light tractor with about-the-farm handiness, amply powered and geared for all farming tasks. Works your existing Category 1 implements.



FR implements designed to match Fordson tractors and made by Ransomes, are also supplied by your Fordson Tractor Main Dealer.

VALUE

FORDSON SUPER MAJOR

52 bhp. Reliable power for every farming job. Low running cost from efficient 4-cylinder diesel engine. More equipment fitted as standard. Dual linkage. Advanced simple-to-use hydraulics with Position Control, Qualitrol, plus exclusive Flow Control. Today's most popular medium tractor.

Ford

And now the Super Major, along with all new Fordson tractors, has the Super Response injection pump with mechanical governor, for smooth power throughout the full gear range. And all Fordson tractors are "carriage paid home".

See these three modern Fordson tractors in the showroom of your Fordson Tractor Main Dealer. He will be pleased to arrange an obligation-free trial of any Fordson tractor on your land, with your own implements.

TRACTOR GROUP FORD MOTOR COMPANY LIMITED DAGENHAM ESSEX · RANSOMES SIMS & JEFFERIES LIMITED IPSWICH SUFFOLK · MAKERS OF FR IMPLEMENTS.

Agriculture

VOLUME 69 · NUMBER 4 · JULY 1962

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1. Trafalgar 7711

CONTENTS

Clean Dairy Equipment 155
Irrigating Grassland *J. S. Morrey* 156
Rotary Cultivation *H. J. Hine* 160
Cow Cubicles *Alec Calder* 164
Hypomagnesaemia and Fertilizers *C. H. Mudd* 167
Sheep Enterprise *P. G. James* 170
The Changing Pattern of Coccidiosis *S. F. M. Davies* 173
Pioneers of Modern British Farming: Arthur Hosier *Lindsey G. Troup* 176
Celery Leaf Spot and New Seeds Legislation *P. D. Hewett* . . 181
Sheep Lore in the North *Sydney Moorhouse* 184
Does Your Cowhouse Drip? *J. F. Hoare* 187
Farming Cameo Series 2: 51. Solihull, Warwicks *J. B. Hill* . . 189
Your Fixed Equipment: Finance for Fixed Equipment *H. Harland* 191
Agricultural Chemicals Approval Scheme 193
Ministry's Publications 194
In Brief 195
Book Reviews 199

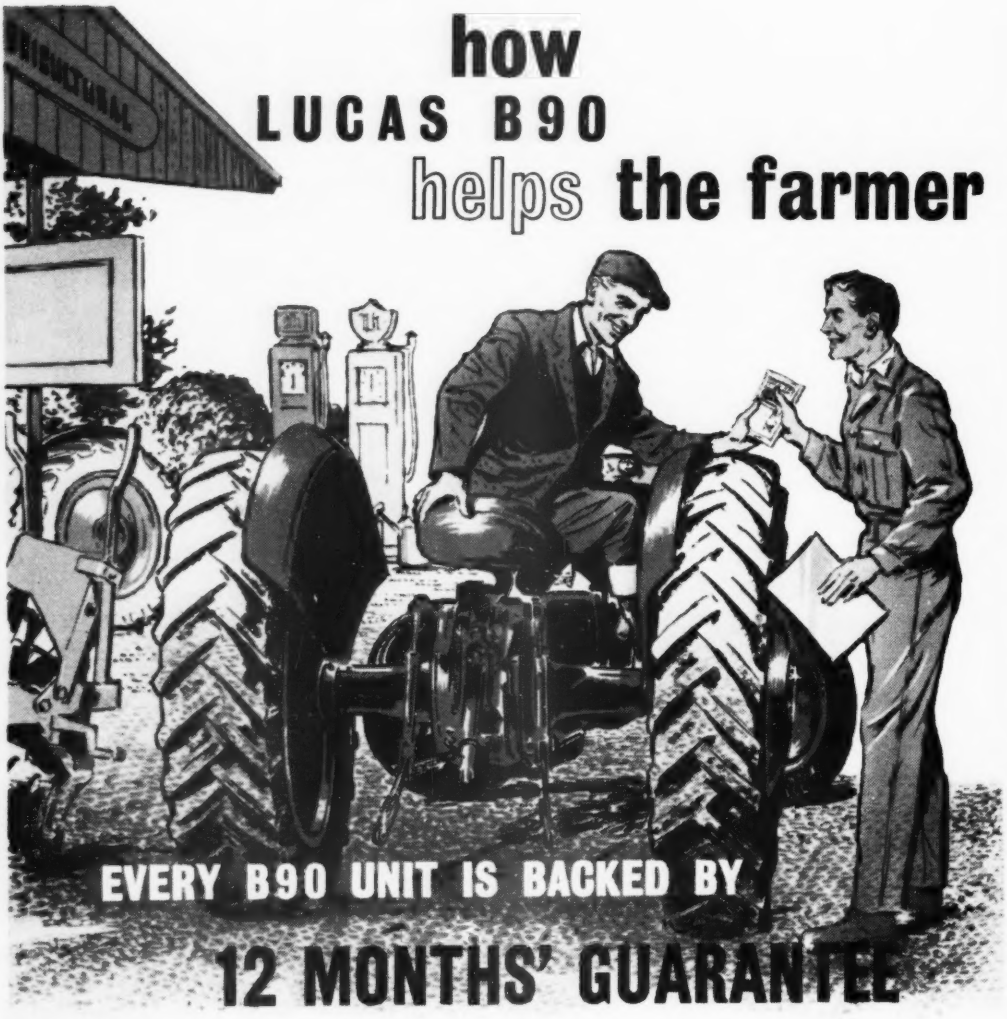
Provided that the source is acknowledged in each instance, such articles and notes as are published in this Journal without any specific reservation regarding copyright may be produced in any registered newspaper or public periodical without special permission. The Ministry does not accept responsibility for statements made, or views expressed, in signed contributions to this Journal or in those reproduced from another source.

Further, the Ministry does not accept responsibility for any of the private and trade advertisements included in this publication.

In the interests of factual reporting, occasional reference in this Journal to trade names and proprietary products may be inevitable. No endorsement of named products is intended, nor is any criticism implied of similar products which are not mentioned.

All communications respecting advertising in the Journal should be addressed to the Advertisement Contractors, Cowlishaw and Lawrence (Advertising) Ltd., Memorial Hall Buildings, 16 Farringdon Street, London E.C.4. Telephone: City 3718.

how LUCAS B90 helps the farmer



Lucas B90 units starters, generators, etc., rebuilt by Lucas to no-compromise standards, are all backed by a 12 months no-compromise Guarantee.
Better than a repaired job, a Lucas B90 unit saves time, too. All your garage or agricultural engineer has to do is remove the old unit and fit the B90 replacement. Means you have your tractor or car back sooner. And fixed exchange prices mean you get a more accurate estimate of the cost. Lucas B90 units are available off-the-shelf at Agents and Stockists throughout the British Isles.

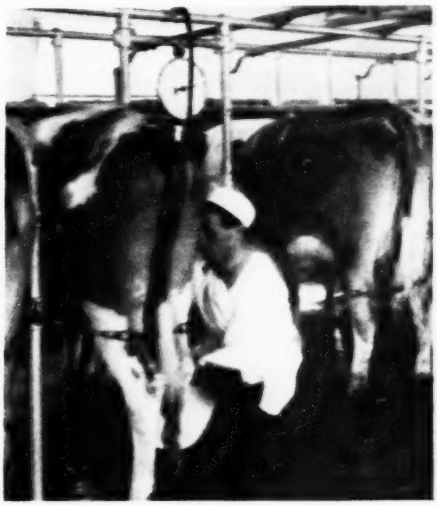
LUCAS

B90 UNIT EXCHANGE SERVICE

saves time now - and money in the long run

JOSEPH LUCAS LTD · BIRMINGHAM 19

Clean Dairy Equipment



WHATEVER the system of milking – pipe-line, direct-to-can, or bucket plant – proper cleaning of the equipment is essential. Otherwise the keeping quality of the milk will be affected and samples will fail the hygiene tests.

Systems of cleaning vary with the type of milking equipment used, but if satisfactory results are to be obtained the cleaning sequence should be as follows:

1. Straight after milking thoroughly rinse away all dung splashes from the outsides of teat-cup clusters and containers.

2. Rinse all internal surfaces free of milk residue by using plenty of cold or tepid water. This must be done before milk dries on to the surface of the equipment.

3. With hand-washing, scrub well in a hot detergent solution and, if an approved chemical agent is used as a sterilant, measure it into the detergent solution at the quantities recommended by the manufacturers.

4. Finally, rinse off all residues of the cleaning material with clean water and store the equipment in a clean place.

With pipe-lines, circulation cleaning is satisfactory provided the circulated detergent sterilizing solution comes in contact with *all* parts of the system to be cleaned and is used at the correct strength and temperature recommended by the manufacturers.

Rubber liners and tubing which is cracked or otherwise in poor physical condition cannot be cleaned effectively; neither can metal equipment coated with milk scale.

With immersion cleaning, it is necessary to renew the caustic soda solution every four weeks and to examine all equipment and bring it back to an 'as-new' state of cleanliness.

Irrigating Grassland

Irrigation and a high level of fertilizer practice will grow good quality grass, but careful thought must be given to such an enterprise before sinking capital in the equipment

J. S. MORREY

I SUPPOSE there are more intangible factors to resolve when considering the return on capital invested in irrigation equipment for use on grassland than in almost any other farming investment. I started irrigating for my two dairy herds, one spring calving and one autumn calving, seven years ago. At my level of fertilizer application it has proved a very worthwhile investment and I am sure it would be equally successful used on pastures for intensive fat lamb production.

Irrigation equipment is expensive and must, therefore, be used only in circumstances that will ensure it has a real earning capacity. This rules out the thought that money can be locked up in equipment for use only in an emergency caused by prolonged drought.

It is well known that high quality grass is far cheaper than concentrates as a source of food for dairy cows; also that the higher the grass quality, the lower the cost per ton of supplementary feeding needs to be. It is easier to grow good quality grass at high levels of fertility and, in practice, the farmer who sets out to produce low cost milk from skilfully managed grassland at high levels of fertility is inevitably committed to a comparatively high annual cost per acre for growing such grass.

Complete success in such a programme depends on high level fertilizer applications, strict timing of grazing or mowing the grass and adequate moisture to ensure immediate regrowth of each successive cycle without delay throughout the grazing season. Fertilizer applications and the timing of mowing or grazing are completely under the farmer's control. But moisture levels, depending on rainfall, can be erratic and unpredictable.

A made-to-measure programme

In my own programme of intensive grassland production, irrigation enables me to grow more grass of high quality, because growth is not checked by shortage of moisture. And, what is equally important, we can maintain a steadier production of grass throughout the grazing season, resulting in

what amounts to a made-to-measure programme of grass growth and utilization. Irrigation may add 20 per cent to the cost per acre, but it has the advantage not only of ensuring reasonably uniform growth throughout the season but also of making sure that all fertilizers applied will be harnessed. Without irrigation, this is often not the case; fertilizer may be applied in anticipation of rain which doesn't come. Thus irrigation provides the opportunity to apply and convert more fertilizer to grass, and it is an insurance that the money paid out will bring an effective return.

Irrigation of pastures with comparatively low annual inputs of fertilizer, where the approach to grassland management is not more than casual, and where milk yields are low or supported by substantial concentrate feeding, will, in my view, never prove economic. It will only add to costs.

Is the expense justified?

When considering the question of installing irrigation equipment, I suggest the first point to resolve is whether the grassland management is at such a level as will carry and justify the additional expense. The next point to decide is what proportion of the grassland area to irrigate; it is important to have clearly in mind an order of priority based on the use to which the grass is to be put. Unquestionably, the best return will come from grass which is irrigated to supply the constant daily grazing needs of cows in full milk, or ewes suckling fattening lambs. They must be fed to appetite every day. Any temporary fall in quality or quantity of available grass will result in an immediate lowering of yield, and if the check is prolonged it will have a disastrous effect for the rest of the lactation.

When it comes to grass for stores, however, a temporary falling off in quality or quantity may not be serious and can to some extent be made up at a later date. The same argument can be used in the case of grass for conservation. As long as it is there and of the right quality at the time it is needed in the winter, it does not have to be conserved at any critical date. It simply forms the bank of high quality food which must be available at the end of the grazing season. It would be difficult on most farms to justify the installation of irrigation equipment deliberately to irrigate for the needs of store stock or grass for conservation. But this does not preclude the use of spare capacity for this purpose if and when available.

In my own farming I have an understanding with my stockmen that I will see they are provided with sufficient high quality grass for the needs of their dairy cows throughout the whole of the grazing season and, that having provided it, it is their clear responsibility to see that it is utilized efficiently by the dairy cows. All grass in excess of the animals' immediate requirements is removed and conserved in the form of silage, so that we always have a larger area of grass coming on in readiness for the cows than they actually require.

Avoid unnecessary pipe shifting

Movement of irrigation equipment is greatly facilitated where grass for grazing and silage is all taken at the same stage of growth. It is then possible to clear adjacent areas of ground more or less together. In this kind of planning it can often be arranged for cows and forage harvester to work close together, with fertilizers and water being applied immediately behind

them. A lot of unnecessary pipe shifting is avoided, and at the same time water and fertilizers can be applied at the most convenient stage in the cycle —immediately after the removal of the grass. As far as possible we try to bring fields up to capacity immediately after grazing or mowing, hoping to get through until the next crop is removed without having to go back and move pipes about in long grass—a disagreeable task and one which damages the sward.

Irrigation pipes often get damaged unnecessarily whilst being moved around the farm. But this can be minimized by planning and using a suitable trailer for their transport. Where pipes have to be carried on roads it helps enormously if temporary wire openings to the fields can be made, say, 20 feet wide. Similarly, temporary openings from one field into the next can be justified if it helps pipe moving. Much valuable pumping time can be lost when moving is not well planned and facilitated in every way possible.

The kind of equipment to use depends on the water supply in relation to the land to be irrigated. If, for instance, you have a long river frontage available it may be sufficient to use portable equipment direct from the river, moving it by tractor from point to point. If, however, a reservoir has to be constructed, or a borehole sunk, I cannot advocate too strongly the advantages of using an electrically-driven pump, incorporating time switches for starting or stopping at any pre-arranged time, always provided the outfit is self-priming. In my experience a lot of time and effort is taken up with tractor- or engine-driven outfits by having to service them before making a start in a morning, particularly if the pump is some distance from the guns or spray lines. It is quite easy to lose up to an hour's pumping time in this way, and at night it is not so easy to arrange for the outfit to stop itself. Besides, the noise of tractors running through the night is often unpopular!

Again, if the area to be irrigated is not adjacent to the source of water supply, an underground main is essential to keep pipe moving down to a minimum. In most circumstances I think low-pressure sprinkler lines are preferable to high-pressure guns, both from the point of view of impact on crumb structure and the saving in power requirement, to say nothing of the risk of bursting pipes and connections. Regard must, of course, be paid to the suitability of soil types for irrigation; it is much easier to irrigate on free-draining soils than on heavy clay.

A modest start

Often it is a good plan to start with a small portable outfit and to expand in the light of experience; the portable main and sprinkler lines will still be usable. The capital required for irrigation varies widely with individual circumstances. I cannot stress too strongly that once a decision to irrigate has been taken the installation should be planned objectively, and while capital expenditure must be an important consideration it is easy to fall into the trap of saving capital only to find that labour and other costs are correspondingly and unjustifiably increased.

I would suggest that a useful minimum starting point is to think of an outfit which will ensure that half an acre of grass per cow in full milk is maintained in full production. This will show the greatest return when considered in terms of critical need. Later on, when experience has been gained, you can decide to what extent the irrigation capacity can be justifiably increased, bearing in mind the all-important consideration of the real

need. In this connection, I say without hesitation that providing irrigation for my spring calving dairy, which is in full milk right through the grazing season, is even more attractive than it is for my autumn calving dairy, which is dry during part of the grazing season. In fact, many dairy farmers, having committed themselves to irrigation and thereby ensured a reliable supply of high quality grass right through the summer, may well turn from autumn to spring calving; and this, in spite of lower prices for milk, can in such circumstances prove a more profitable enterprise.

My figures

The earning capacity of an irrigation plant will vary according to the circumstances in which it is used. As a generalization, the more intensive the farming the greater will be its earning capacity. The results from my spring calving dairy during the summer of 1961 may give some indication of what can be achieved in favourable circumstances. A dairy of 85 spring calving cows was maintained on 50 acres of grass from mid-March to mid-November, producing 62,135 gallons of milk supported by 1·6 lb of cereals per gallon of milk produced. The overall cost of producing this grass, including irrigation, was about £25 per acre. The concentrate requirement of this dairy in the summer of 1961 without irrigation would have been very heavy indeed and the output of milk undoubtedly very much less.

Mr. J. S. Morrey, well-known writer and lecturer, farms 600 acres near Devizes, Wiltshire. Winner of the Thomas Baxter Award for services to dairy farming, he is a Special Member of the Milk Marketing Board and a member of the Wiltshire Agricultural Executive Committee.

Part-time Courses in Horticulture

The City and Guilds of London Institute recently announced the publication of syllabuses for the development of courses of part-time education in horticulture on a national basis.

The scheme of courses, prepared in collaboration with the Horticultural Education Association, has been planned at three levels:

Stage 1–For the young entrant (approx. 15-18 yr)
Stage 2–For the more advanced student
Stage 3–For potential managers

The courses are intended to be complementary to practical training on the job and will provide a suitable preparation for a full-time course in horticulture at a horticultural or agricultural institute. They will cover the practice of horticulture, fruit crops, decorative horticulture, vegetable crops and crops under glass, the principles of horticulture including general science (soils and manures) and horticultural biology, and machinery.

Full details of the scheme of courses and examinations, together with the syllabus for Stage 1—General Horticulture (price 1*s.* post free), can be obtained from The City and Guilds of London Institute, 76 Portland Place, London, W.1.

The Syllabuses for Stages 2 and 3 are in course of preparation.

Rotary Cultivation

H. J. HINE

An inter-row rotary hoe, with three independently mounted rotor units

SINCE the end of the eighteenth century the plough, with little change in shape, has held its place as the basic cultivation implement, but it has always had rivals. In the nineteenth century, many inventors tried to design machines which would prepare tilth by rotary motion, and they hoped that such machines would displace ploughing altogether. These inventions were of little more than academic interest until high-powered internal combustion engines were developed for field use.

A contractors' machine, using a large oil engine and having its tines mounted on a nearly vertical rotor, was designed in Britain, and by 1925 machines of this kind were cultivating many thousands of acres. In Australia, experiments had been going on since 1912 with the object of producing machines to be towed by a farm tractor, and A. C. Howard had designed a tractor-operated machine with a horizontal rotor driven by the engine of the tractor.

The success of the present-day rotary cultivator has been due, in some measure, to the realization by those concerned in its development that its most useful application in farm work lies not in replacing the plough in all conditions but in being complementary to it. Such uses as stubble treatment before ploughing and the quick production of a tilth in ploughed land, have established rotary cultivators as standard implements of agriculture. Alongside the development of tractor-operated machines, small walking-tractor types were evolved which have become the primary method of cultivation in some market gardens.

The growth of rotary cultivation has coincided with the period of development of chemicals to control weeds. Since weed control is reckoned to be at least half the justification of ploughing, it may well be that rotary cultivation will have a greater application in agriculture than would have been possible without the help of chemical weed-killers. But rotary cultivation can itself play a part in the controlling of weeds. The fine surface soil produced by one

passage of the machine can help weed germination; then a second passage, when the weeds are growing, can destroy some of the plants.

Choice of crumb size

In the work of cultivation, different methods of operating rotary cultivators can produce different effects on the soil. Indeed, it might be said that what is lacking at present is not the provision of reliable and well-designed rotary cultivators, but a knowledge of how to use them to the best advantage. This is not surprising when it is remembered that ploughing has so many generations of tradition behind it. Moreover, ploughing has the fairly simple task of cutting a furrow slice and inverting it, with the object of burying weeds and, usually, of leaving the land in the best condition for weathering to take place. Choice of shape of mouldboard and variations in speed of travel can affect the result from ploughing; but the use of a rotary cultivator gives a much wider choice of soil condition than can be obtained with a plough. Even the adjustment of the hood which shields the rotor can have considerable effect on the size of soil aggregate produced, and on the gradation in size of particle from the top to the bottom of the cultivated layer. Shape of blade also affects the resulting tilth. A lighter form of cultivation can be done by rotary tillers with no power-drive. These have blades mounted in gangs as on a disc harrow, forward movement of the tractor and implement causing the blades to rotate.

Producing a fine tilth

At a given speed L-shaped blades probably produce more small crumbs than pointed barbs or pick tines. Whatever shape of blade is used, the lower the forward travel speed compared with rotor speed the finer the tilth produced, because more cuts are made by the blades for every foot of travel. Cutting by the rotors is, however, not the only mechanical breaking up of aggregates which occurs; the impact of the cut-up soil on the shield or hood further breaks the aggregates and helps to mix the particles. The impact against the hood probably has the same effect on the soil concerned as would a fixed tine travelling through the soil at 10 miles per hour. The closer the shield is situated to the rotors, the finer the tilth which results,

The shield can be hinged back out of range, or can be removed altogether, so that when the machine is used in the autumn, some clods can be left on the surface of the land. If the crumbs near the surface are too small, they may weather during the frosts of the winter into particles so fine that they cap together in the spring. In any case, there is everything to be said for using the effects of weathering wherever possible instead of relying entirely on mechanical cultivation. Freezing and thawing, and wetting and drying, produce planes of weakness in the clods. Spring cultivations break the soil easily along these planes where cohesion is low.

Investigations to find what changes occur in the crumb size of soil during seedbed preparation, showed that in one organic silty loam soil, ploughed in winter and left unbroken until spring, 22 per cent of the weight of soil in the cultivated layer consisted of aggregates of between 2 and 4 inches diameter in April. Only 12 per cent was in aggregates measuring less than $\frac{1}{8}$ inch in diameter. After harrowing with a fixed tine implement, the weight of aggregates between 2 and 4 inches diameter had fallen to 18 per cent and the weight of aggregates smaller than $\frac{1}{8}$ inch diameter had risen to 21 per cent. The land

Inter-row hoeing with a market garden rotary cultivator

was then rotary cultivated. After one passage of the machine, the weight of clods between 2 and 4 inches had gone down to 13 per cent and the aggregates under $\frac{1}{8}$ inch had risen to 22 per cent. After two passages, the weight of aggregates between 2 and 4 inches in diameter had fallen to 11 per cent while the percentage of aggregates under $\frac{1}{8}$ inch in diameter had risen to 26.

Ways to avoid smearing

Amongst the techniques to be learned in the operation of rotary cultivators, whether of the tractor-drawn field type or of the walking-tractor type, is the avoidance of a smear or pan at the depth of working. This, indeed, is essential in ploughing too, but in rotary cultivation the trouble is less likely to be seen easily. In certain soils and conditions, a rotating blade skimming along the bottom of the cultivator layer can produce a glaze which is for some time impervious to water. New shapes of blade may be found that will make this trouble less frequent. But even with existing shapes, time of work and method of operation can control the amount of smear to some extent. The moisture content of the soil has considerable influence and so has speed of work, particularly the speed of the rotor relative to the forward travel speed of the implement. It is worth scraping away the cultivated soil from time to time to see whether glazing is occurring, and whether the work ought therefore to be postponed until the moisture content of the soil has changed.

Some L-shaped blades are fastened to the rotor-spindle at an angle such that only the cutting edge of the blade makes contact with the soil below the level of the cut; the excavation by the sharp edge of the blade leaves an open space, or zone of clearance, for the rest of the blade to pass through without rubbing against the firm soil behind it. This makes smearing less likely than if the body of the blade were sliding on the soil. For a given shape and inclination of blade, however, full clearance is produced only if the blade is rotating fast enough in relation to the forward travel speed of the machine. If the rotor speed is low in relation to the forward speed, the path of the blade relative to the soil it is cutting is fairly flat, and there may be no zone of clearance at all. In that case, the body of the blade rubs along the land and will leave a polished surface on some kinds of soil.

Even if a smear has been produced, it is very thin and it is easily broken by a fixed cultivator tine lightly scratching the soil below the cultivated layer. To achieve this, but more particularly to combine the effects of rotary cultivation with those of fixed tine cultivation, implements have been made which incorporated both a rotor and a toolbar with fixed tines. A difficulty in a combined implement, however, is that the forward speed possible in rotary cultivation may not be the best speed for fixed tine cultivation.

Other uses

Rotary motion is peculiarly well suited to the mixing of one component of a mass with another, as exemplified in cattle-feed mixers. Manures, lime and crop residues can be mixed into soil very thoroughly; experiments have shown an adequately even distribution of additives down to a depth of 6 inches after two passages by a rotary cultivator. When the material to be mixed is long, such as straw, considerable shredding takes place in the same operation as the mixing.

Rotary implements may be of great use in controlling certain rhizomatous weeds, such as couch or twitch, more effectively than present chemical weed-killers. The work needs a machine in which the ratio between the speed of rotation of the tines and the forward speed of the outfit across the field can be arranged so that the rhizomes are cut up into pieces of no more than 4 inches long. Power for deep working is necessary. This first cultivation must be followed by further cultivations as soon as new growths are seen, and these subsequent operations can be carried out at higher speed because the soil has already been disturbed. But the relation between rotor speed and forward speed must still be such as to give a cut of no more than 4 inches. Experimental work has been done by Durham University on couch and bracken in Northumberland and by the N.A.A.S. on couch in the Eastern Counties.

A specialized use of rotary cultivation in the sphere of weed-killing and the reclamation of bogland has been tried out by the Irish Sugar Corporation in an experiment made with a view to putting a large acreage of land into

A rotary cultivator being used on grain stubble

cultivation. The experiment was started at Gowla Bog, near Ballinasloe in the county of Galway. Since the machines were to be tractor-operated, it was essential to have a tractor which gave low ground pressures. A special crawler tractor was devised which exerted a pressure of only 1·5 lb per sq. in. on the soil. These specially-equipped tractors were used first during the early stages of drainage. As soon as the drainage improved, rotary cultivators were towed by the same crawler tractors to break up the bog and to incorporate lime and fertilizers into the soil. When this had been done, the land was ploughed deep and then cultivated again by rotary cultivation. The level of the bog became steadily lower, due to evaporation and the the action of the drainage ditches. The Peat Land Research Centre, at Tuam in Co. Galway, is continuing experimental work of this kind.

The Department of Agriculture for Scotland has used rotary cultivators in its work of winning peat for horticultural purposes and for fuel. For this, a high rotor speed is used. The peat is on well-drained bog, and the object is to take off about 1 inch in depth of the peat at one passing of the machine.

Mr. H. J. Hine, B.Sc. (Oxon.), Dip. Agric. (Eng.), is Regional Mechanization Adviser in the National Agricultural Advisory Service at Cambridge.

Cow Cubicles

ALEC CALDER

Some Cheshire farms have found sawdust bedding in single stalls to have saved 75 per cent on conventional methods

---

A CHANGE-OVER from shippons to loose housing of cattle and parlour milking is becoming increasingly apparent in Cheshire. This change has been made in the interests of labour economy and frequently in association with the self-feeding of silage.

The all-grass farm is common and is justified in many cases because of the wet, heavy land typical of many parts of the Cheshire Plain. In these circumstances the cost of straw for bedding can amount to 6*s*. per cow per week. Sawdust or shavings may be used instead of straw; also they are sometimes slightly cheaper and often preferable as far as cleanliness of the cows is concerned.

With the long winters associated with heavy land, the annual cost of bedding can therefore amount to £7 per cow per year. A typical (though not average) Cheshire dairy farm with 60–70 cows may have an outgoing of £400–500 a year for bedding alone.

Sawdust instead of straw

This problem has been solved to the satisfaction of Mr. Howell Evans, of Green Lane Farm, Saltney, Chester. He has a small farm of 36 acres on typical low-lying land with a clay subsoil, consisting of three blocks of fields all away from the homestead. One block is beyond a main railway line, approached by a level crossing, and another is three-quarters of a mile from the homestead. No suitable drinking water is available in any of the fields.

This layout and circumstances favoured the adoption of a zero grazing system, with the cows housed in a yard but having an outdoor concrete exercise area. To overcome the problem of bedding, a system of cubicle housing of the cows has been developed. A cubicle is best described as a single cow stall except that the floor is saucer shaped, so that it will contain the sawdust used as bedding.

Each cubicle is 6 ft 10 in. long and 3 ft 8 in. between the divisions. The divisions are of $1\frac{3}{4}$ in. tube bolted to 2 in. channel iron uprights set in the base. Each division is carried to within one foot of the rear of the bed, to prevent cows lying across the back of the cubicles. The bed itself is raised some 10 inches above the floor level, and this is an essential part of the construction.

Since a cow will not walk up a step backwards, she is forced to enter the cubicle head first. A raised bed also allows mechanical cleaning of the dunging area with a tractor-scraper blade.

There is very little wastage of sawdust, since no dung actually falls in the cubicle; in fact, the only sawdust lost is that carried out of the cubicle on the cows' feet—say, 10 lb per cow per week.

Mr. Evans's farming system was demonstrated by the N.A.A.S. last September, and subsequently four farmers in the area have installed cubicles. These farms carried larger herds—of between 40 and 60 cows—and the system has been working well in all cases. The cubicles on these farms are very similar to the original, but minor modifications in dimensions have been made. In one case ground limestone has been used for bedding, but it proved to be rather dusty and required damping down.

Cow cubicles in use

Cow training

A certain amount of cow training has been necessary when introducing a large herd to cubicle housing, and the following points are worthy of note in this respect:

The beds should not be supplied too liberally with sawdust in the first instance, since spillage into the dunging area behind can cause cows to lie there rather than in the cubicle.

The dunging area should be cleaned out twice daily at first, as cows are tempted to lie in the fresh warm dung. When they become accustomed to the cubicles, cleaning out of the dunging area once a day suffices.

Individual cows may be slow in getting accustomed to lying in a cubicle. Fastening in with a chain or back cord for two or three days should provide a satisfactory answer.

Dunging

The use of cubicles as an alternative to more conventional bedding solves one problem, but it does aggravate another. With a partly-bedded cattle yard, about half the dung and urine falls on the bed and half on the concrete exercise area. With cubicles, *all* the excrement falls on the concrete.

Methods of handling slurry on the farms involved are interesting. In one case there is a completely covered yard. The cows self-feed at a silo, and the silage, cubicles, and exercise area are all under one roof. Here slurry is removed by tractor-scraper and is pushed into a spreader in a sunken pit. A hinged flap on the edge of the pit ensures that all the slurry enters the spreader. The spreader itself has a rear sluice gate which can be raised or lowered by means of a winch mechanism and the height controlled for spreading the various consistencies of slurry.

On another farm, although the cows are housed in covered cubicles, there is a large open area of concrete for exercise purposes. Here the slurry is diluted with rainwater on the yard and is treated as a liquid. Handling is by means of a vacuum-operated slurry tank. Some additional dilution is, however, frequently required, particularly in dry weather.

Organic irrigation and the use of a slatted floor access area between the cubicles is another method worthy of investigation.

The most impressive observation about cubicle beds is the remarkable cleanliness of the cows, particularly the hindquarters and udders. The use of cow cubicles with sawdust as bedding has reduced bedding costs by at least 75 per cent on conventional methods previously followed on these farms.

Hypomagnesaemia and Fertilizers

C. H. MUDD

The N.A.A.S. Great House Experimental Husbandry Farm has been examining the possible association between fertilizer use and lowered blood magnesium in cattle and sheep. In this article the Director gives some trends of thought emerging from their experiments

HYPOMAGNESAEMIA, staggers, grass tetany and Hereford disease are all names for the same disease, caused by a shortage of magnesium in the blood of cattle and sheep. The usual symptoms, trembling, a staggering gait, collapse, convulsions and rapid death, are all too well known to most farmers. It is generally most common in the spring but it can occur at any time of the year. It is still a very baffling disease, and although it is known to be associated with a fall in blood magnesium, the precise reason for this change is still obscure. Although the normal concentration of serum magnesium is between 2 and 3 mg per cent, some cows can apparently remain healthy with a serum magnesium content of about 1 mg per cent or less, whilst others may show mild initial symptoms of the disease at levels between 1 and 1·5 mg per cent.

Environmental factors undoubtedly play a part in triggering off an attack. A cold wet spell, a change of field, transporting in a cattle wagon, calving, oestros, or a dog chasing the animals, will all cause stress which often brings on an attack if blood magnesium is low.

The method of control is well known and widely practised. For adult cattle 2 oz calcined magnesite, fed daily, gives sufficient magnesium to give protection. This method is not ideal, however, for it has to be given every day and if the dose is withdrawn blood magnesium levels may fall quickly. Calcined magnesite is not acceptable and must be given with some other food, generally 2 lb of cereal. This adds an unnecessary cost to feeding cattle at grass, and it is also difficult to give the correct dose to sheep, fattening cattle, stores and dry cows, which do not come in daily for milking. The possibility of administering magnesium as a bullet in the same way as cobolt deficiency is corrected is being investigated, but at the moment it is not a practicable alternative.

Magnesium in the diet

For some time, ley farming and high levels of fertilizer use have been blamed. It is said that the inability of the stock to correct the mineral balance is due to 'unnatural' methods of grass production. It is true that the disease often occurs on well-fertilized pastures, but this is not always the case, for it also appears in beef breeding cows which outwinter on relatively poor pasture. In any case one would hardly consider adopting a low standard of output merely to reduce the incidence of the disease! Most cases occur on pastures in the spring when plant growth is rapid.

A possible remedy would be to apply magnesium to the pasture so that the grass will contain sufficient for the animal, but the quantities which have been advised to ensure a significant rise in the magnesium of the plant tissue are so high that it may be uneconomic. Recent experiments, however, have indicated that quite small dressings may be beneficial on certain soils. Trials have shown that some animals appear to be incapable of utilizing magnesium in the herbage, even if there is sufficient available. Research is going on at many centres.

Two other elements may play some part in the complex process of assimilating magnesium. They are potassium and sodium. The use of sodium or common salt may be beneficial, but there is little real evidence of this. Potassium, however, appears to be antagonistic to magnesium and, if present in quantity in the soil, the grass takes it up readily, especially if nitrogen has also been applied thereby excluding magnesium in the plant. This in turn causes a shortage in the animal's blood. Several experiments have been carried out both in this country and abroad which have demonstrated beyond doubt that there is a relationship between the application of heavy dressings of nitrogen and potash and hypomagnesaemia.

Obviously we cannot omit fertilizers and revert to a low output of grass simply to avoid the possibility of hypomagnesaemia. Where potash is deficient it must be applied, but it could be put on at some time of the year other than in the spring when there is most chance of the disease appearing. Nevertheless, to promote early growth, nitrogen must go on in the spring. In 1959 at Great House Experimental Farm on the Pennines, a trial was started in co-operation with the Veterinary Investigation Officer to test the effect of applying potash at two different times of the year. In previous years it had been the practice to apply a complete compound fertilizer in late March and straight nitrogen during the summer. Usually there were a few cases of hypomagnesaemia in the dairy herd, especially in the spring.

First experiment

In September 1959, three fields were divided in half, and to one half of each, 1 cwt muriate of potash and 3 cwt superphosphate were applied per acre. A dressing of 30 units of nitrogen was applied to this area the following March and, at the same time, a complete compound containing the same total amount of nitrogen, phosphate and potash was applied to the other half of each field.

The cows were blood sampled before turning out to grass, and divided into two groups, one group being rotationally grazed round the half fields which had received potash in the autumn and the other group round the half fields which had received all fertilizers in the spring. Samples taken after turning out revealed that the blood magnesium in both groups had fallen but that it fell

significantly lower in the animals grazing pastures which had received potash in the spring.

After 10 days these two groups were reversed so that those grazing spring-fertilized fields went on to autumn-dressed fields and vice versa. Further samples revealed that blood magnesium rose when the change was made from spring potash to autumn potash and fell on changing from autumn potash to spring. No clinical cases of hypomagnesaemia occurred however; although in many cases the blood magnesium was dangerously low, there were no stress factors to trigger off an attack.

Second experiment

The experiment was repeated in 1960–61, but this time only half the animals in each group changed over, and the remainder stayed on one or other treatment throughout the trial. Although blood magnesium levels fell in all animals, differences were not so marked as in the previous year, and indeed were not significant.

Weather conditions were unfavourable and there were a number of cold, wet nights. Six cases of hypomagnesaemia occurred—five in the animals grazing pastures which had received potash in the spring, and one in the field which had been dressed in the autumn. The latter animal had a further attack in the year and died, indicating that it was particularly susceptible. Of the other five animals affected, two died; the remainder recovered after an injection of magnesium. This experiment is being repeated.

Late-summer potash may be an answer

These trials indicate that there may be a system of fertilizing which will reduce the possibility of hypomagnesaemia occurring. It is certainly not the complete answer to the problem, for it is known that cases break out on farms where no potash has been applied. Late summer applications of potash do not involve additional cost, for on most farms nitrogen is applied in August or September to stimulate autumn growth. The complete fertilizer can be applied at that time and the spring dressing for early bite confined to nitrogen. This practice has the additional benefit of an out-of-season cash discount for fertilizer.

One obvious query arises. Will the potash and phosphate be leached out of the soil by the winter rains? Most soil chemists believe that the nutrients are held in the soil over winter and are available for the following year's growth. Experimental evidence is not conclusive; it may depend on the type of soil and the amount of winter rain. Experiments are in progress to check this point.

For those troubled with the disease, it may be worth while trying such a system of fertilizing, particularly where the feeding of calcined magnesite is particularly difficult.

Mr. C. H. Mudd, B.Sc. (Agric.), has been Director of the Ministry's Great House Experimental Husbandry Farm, Helmshore, Rossendale, Lancs for the past 11 years.

Sheep Enterprise

The first of two articles by

P. G. JAMES

Like any other agricultural activity, a profitable sheep flock implies technically efficient production in an economically efficient environment

---

SHEEP farmers give a lot of thought to the technical requirements of their flocks, but comparatively little time is spent on the associated economic problems. Yet both aspects must be considered if the best results are to be achieved. Wrong economic decisions will inevitably reduce the profit potential of even the most technically efficient flock.

Size of flock

In the first place, it is important to ensure that the size of the flock fits in with the rest of the farm business. In the western counties, or on the hills, sheep may be the most important activity on the farm, and the farm organization will naturally be built around the sheep enterprise. Under such circumstances the flock will tend to be a large one. In the eastern and south-eastern counties, sheep can seldom compete directly with cash crops. On such farms, however, there is usually some permanent pasture, and some leys are grown as part of the crop rotation. There are, moreover, by-products of the arable crops—such as sugar beet tops and cereal stubble—which can be utilized by sheep.

In such circumstances a sheep flock is a supplementary enterprise, because its presence contributes to the fertility of the farm. Consequently, its demands for labour, capital and land must not clash with the demands of the other major competitive enterprises, and success will depend on the extent to which the sheep enterprise is dovetailed into the existing farm organization as unobtrusively as possible. On an arable farm, therefore, a moderate-sized flock may utilize by-products and add materially to total farm income. But a large flock that competes directly for land with cash crops, may reduce profits.

The size of the flock should be related to the carrying-capacity of the *unavoidable* grassland acreage; under present conditions this acreage should not be increased to meet the requirements of a larger flock.

The size of the flock may also depend, to some extent, on the need to employ a full-time shepherd. Obvious examples are the pedigree flock producing ram

lambs, and the folded flock on arable crops. Both systems demand professional full-time shepherding, and in such a case the flock should never be much less than 300 breeding ewes.

It is difficult to generalize about the area of pasture a flock requires, for grassland quality varies not only between farms but also between fields on the same farm. The number of sheep that can be kept on a given acreage of land is influenced by many factors—the level of grassland management, the aspect and geology of the land, the rainfall, the quality of the sward and so on—and it is impossible to determine their importance beforehand. Only experience can show the stocking rate on any one farm. Over-stocking can be disastrous, so it is prudent to start with too few sheep, and build up the size of the flock as experience indicates.

Choosing the system

Having decided upon the size of the sheep enterprise by reference to its relative importance on the farm, a correct decision must be taken concerning the system of production to be adopted. There are several alternative methods of managing sheep. The farmer must first decide whether to keep a permanent or a part-time flock. If he chooses a permanent flock, he can produce early* or late lambs. If he has late lambs, he can sell lightweight (45 lb and less dead weight) or heavyweight lambs. He can also choose a pure-bred or a cross-bred flock. If he decides on a part-time flock, he can choose either a flying flock or a dry flock. A flying flock is defined as a breeding flock from which both the ewes and their lambs are sold in early summer: a dry flock consists of lambs which have been bought in the late summer or early autumn sales, and sold as fat hoggets between January and the end of March.

The factors that should guide a farmer in choosing between these alternatives are not entirely economic ones. They include the amount of capital, the amount of labour and the amount and quality of grassland that can be spared to support a sheep flock. A farmer who is short of capital may choose a flying flock, because cast ewes are cheaper than maiden shearlings. He may also choose this system if grass or labour is short, particularly between June and September. In this respect, a flying flock can be an attractive supplementary activity on dairy farms. The flock would scavenge after the dairy herd in the spring and early summer when grass is relatively plentiful, but the ewes with their lambs at foot would be sold before they started to compete with the cows for pasture, when grass gets scarcer in midsummer.

Even if the grass is poor, a flockmaster may keep a breeding flock and sell store rather than fat lambs. If labour can be spared in winter, but not in spring or summer, store lambs may be bought in the autumn and fat hoggets sold in the spring. When a farmer has a skilled shepherd and the necessary knowledge and enthusiasm, he may keep a pedigree flock.

Profit per ewe or per acre is therefore not the only factor which influences a farmer in making a decision between alternative systems of sheep production. But even when technical considerations have been taken into account, the farmer may still be able to choose between two or three different systems. Choice must then be on the basis of their comparative profitability.

---

*An early lambing flock is one in which at least 75 per cent of the lambs are born before the end of January.

The choice on this Herefordshire farm was a cross-bred flock of Clun crosses and Welsh half-breds, which are put to Hampshire rams

Alternative systems

Available evidence suggests that the most profitable system under present circumstances is the pure-bred flock, producing fat lambs. The gross margin of this system (about £7 a ewe) is about 25 per cent higher than that from the cross-bred flock (about £5 5*s*. a ewe). The flying flock is essentially an extensive system of sheep production. Additional costs are reduced to a minimum and, although receipts are low, a reasonable net return (about £2 10*s*. a ewe) can be expected. The dry flock, on the other hand, is a more intensive system. The store lambs are hand-fed all the time they are on the farm, and fodder roots and hay have to be grown or purchased for additional sheep keep. The anticipated return is very variable, depending mainly on the difference between the price of the store lamb and the subsequent selling price of the fat hogget. But the average net return (about 9*s*. a lamb) hardly seems to justify the trouble and expense incurred. In fact, with current costs and prices, this is an instance where it might be better to leave resources unused on a farm, rather than attempt to use them through sheep.

Pedigree ram lamb production is a specialist system requiring skilled shepherding and an enthusiastic, knowledgeable flockmaster. On arable farms it should be contemplated only where resources (particularly grass) are already available to support a flock of 300-plus breeding ewes, which alone would justify employing a full-time shepherd. On hill and grass farms, pedigree ram lamb production is an attractive proposition.

The folded flock has become less fashionable since the war. This is a method of feeding sheep, and is not a separate system as such. It could be used in any of the systems already described, but in practice it is only likely to pay with pedigree flocks. Although the folded flock has several characteristic advantages—parasitic worms can be easily controlled, and sheep confined to a fold do not waste energy searching for food—its greatest disadvantage is the high labour cost inevitably incurred. To be successful, therefore, the size of a folded flock must be such as to warrant the employment of a full-time shepherd, and this means a flock of at least 300 breeding ewes.

Mr. P. G. James, M.A., is a lecturer in Agricultural Economics at the University College of Wales, Aberystwyth. He wrote an article on the economics of pedigree ram lamb production in the October, 1960, issue of *Agriculture*.

The Changing Pattern of Coccidiosis

S. F. M. Davies

Intensive systems of poultry-keeping favour infection by coccidia. The use of preventive drugs brings its own complications

A FEW years ago poultry farmers knew coccidiosis mainly as an acute disease in chicks of up to about six weeks old; the symptoms were blood in their droppings shortly before they died. Farmers soon learned to spot the first signs of trouble and usually had a bottle of medicine at hand to treat the affected batch. A soluble sulphonamide drug, given in the drinking water for periods of up to six days, was the usual treatment, and although seriously sick birds died, the remainder responded.

Older birds affected

By 1955, as husbandry became more intensive, particularly as regards younger birds, and flocks increased in size, a change was noticed in the pattern of disease. Infection with coccidia was more prolonged within the flock, i.e., at any one time only a few birds were sick; besides young chicks, the disease seemed also to be affecting birds older than six weeks, and in an increasing number of outbreaks there was an uneven response to treatment. Many birds remained in poor condition and seemed to have suffered an appreciable set-back in growth.

Post-mortem examinations showed that in addition to the prevalence of the easily recognized caecal haemorrhages, caused by *Eimeria tenella*, there was an increasing incidence of an intestinal type of coccidiosis caused by *E. necatrix*. A number of these intestinal species had been known for several years, but hitherto they had been only a minor cause of disease. It seemed, therefore, that birds were being exposed to greater numbers of coccidia and that short-term treatments were less effective when used in the larger flocks. Because of the expense involved, re-treatment of large flocks could not lightly be undertaken, and in any event farmers were loth to use sulphonamides more widely because of the risk of precipitating an outbreak of haemorrhagic disease. Under some conditions, not fully understood, this disease could be a greater catastrophe than coccidiosis.

Intensive systems favour the disease

At about this time, a number of farmers were adopting the deep-litter system for their existing laying flocks, and they were becoming increasingly interested in the intensive production of broilers. This system of husbandry was not entirely new to Britain, but recently it had been developed along more scientific lines in the U.S.A. and had been given a further trial by a few enthusiasts in Britain. Flocks were established in new poultry houses built to conventional designs and in older houses, cow-byres, pigsties and glasshouses converted for use by either layers or growing birds.

Litter conditions in many of these houses were poor and coccidia were able to survive in large numbers. It was soon obvious that, for the successful husbandry of laying stock, and particularly for the newly-emerging broiler, better housing had to be provided. So houses were then designed specifically to provide more efficient insulation and ventilation and with controlled heating and lighting. Facilities were also made for continuous feeding and watering.

Anti-coccidiosis drugs in food

Under these intensive conditions an additional method of controlling coccidiosis in growers had found favour among poultrymen in the U.S.A. Anti-coccidiosis drugs were mixed at a low level in the food and were fed continuously during the rearing period. Such a system of preventive treatment was not without its drawbacks. For example, continuous medication interfered with the birds natural development of resistance to coccidia, and from the long-term point of view there was a possibility of the development of strains of coccidia which would not be susceptible to the effects of the drug. However, as no suitable alternative was available, and as the new forms of intensive husbandry demanded the maximum protection against coccidia, the method was gradually adopted by poultry farmers in Britain also.

Initially, the anti-coccidiosis drugs, or 'coccidiostats', as they came to be known, were made available in a pre-mix for individual mixing on the farm. Accurate and thorough mixing was necessary, as the drugs were being used at very low levels and poor mixing could result either in inadequate control of the disease or in poisoning of birds which received an overdose. The margin of safety of the early coccidiostats was not very great.

In time, as proprietary foods containing a coccidiostat were made available, a majority of poultrymen preferred to have their food supplied with the drug already incorporated. This largely avoided the dangers of bad mixing and under reasonable conditions of management prevented serious losses from caecal coccidiosis. Nevertheless, in very intensive conditions, or where too great a reliance was placed on the coccidiostat and husbandry was allowed to deteriorate, outbreaks of disease were still cropping up.

Effect of drugs

Naturally enough, the earlier compounds had, during preliminary laboratory testing, been selected for their activity against the caecal form of coccidiosis. Under field conditions the incidence of this disease declined, but it appeared that the drugs were capable of exerting only a limited control of the intestinal forms of the disease. The choice of coccidiostat was, therefore, having an effect on the pattern of coccidiosis. During the next few years the

scope of research on coccidiosis was extended to include studies on the intestinal coccidia. These things were expected of the new compounds: to be more effective than previous drugs, to have a greater range of activity against intestinal species of coccidia, and to have a wider margin of safety.

For broiler flocks, reared in modern intensive houses, these aims have largely been achieved and the cost of anti-coccidiosis medication (estimated at approximately £$\frac{1}{2}$ million per year) is accepted as a regular item of rearing costs. Outbreaks of disease caused by *E. tenella* or *E. necatrix* are seldom serious, but two more species of intestinal coccidia, *E. acervulina* and *E. maxima*, are now recognized as common parasites in Britain. During the past year yet another species, *E. brunetti*, has been identified as a further cause of sporadic outbreaks of disease. Fortunately, these coccidia are less harmful than the earlier species, but there is still a need for a coccidiostat which is equally active against all the coccidia.

Question of resistance

The great increase in the population of broilers and laying birds led in turn to a necessary increase in the numbers of birds being reared as replacements. For reasons of economy, management had to be along fairly intensive lines. It was doubtful, however, whether control measures suitable for broilers, which receive preventive medication almost up to the time of slaughter, could be applied directly to birds which had at some time to be changed on to unmedicated food. It was essential that during treatment such birds should be allowed to build up a resistance to coccidiosis. But this resistance is dependent both on the number of coccidia in the bird's environment and on the degree of effectiveness of the coccidiostat, so it is not surprising that outbreaks of coccidiosis occur in older replacement birds, even when apparently adequate control measures have been adopted. The coccidium usually responsible is *E. acervulina*, a species which is slow to induce a resistance and often is not suspected as a cause of trouble until pullets are at the point of lay or until egg production has started. Usually mortality is negligible, but even a slight reduction in egg yield soon makes a bird unprofitable. A completely satisfactory solution to this problem has not yet been found.

Turkeys too

In the rearing of turkey poults also, continuous preventive treatment has been an accepted safeguard. Here, the turkey farmer is helped by the fact that, after eight weeks of age, poults which have been protected by a coccidiostat will have built up some resistance to infection. Although not completely immune to coccidia, they can then withstand the adverse effects of any reinfection. After about eight weeks it was safe to withdraw the coccidiostat. Recently, however, there has been some evidence that the use of more effective drugs has reduced the degree of resistance which poults have acquired during preventive treatment and, faced with a massive reinfection after the coccidiostat has been withdrawn, turkeys of 12–16 weeks of age have suffered from severe coccidiosis.

This serves as a warning that under some conditions treatment with a coccidiostat can be too effective.

Mr. S. F. M. Davies, B.A., B.Sc., M.R.C.V.S., is a Senior Research Officer at the Ministry's Central Veterinary Laboratory, Weybridge.

Arthur Hosier

Lindsey G. Troup

ONE of the milestones in British agriculture of the first half of this century was the movable milking bail, and the name of Arthur Hosier, who pioneered its use in this country, is linked with it.

Arthur J. Hosier, the youngest of a family of twelve, was born in Shawford, on the borders of Wiltshire, Berkshire and Hampshire, in 1877. At a time when British farming was in a trough of depression, life for the Hosier family was difficult, and young Arthur had early to learn his farming the hard way. However, by 1910, after six years' successful management of an agricultural machinery business, he was able to take a farm of 600 acres with his brother. Price levels of corn and other commodities had slowly but steadily risen, mechanization in the form of steam tackle for ploughing and cultivation had come in—particularly to the benefit of the larger areas of light land—and finally the initial scientific work on artificial fertilizers was proving worthy of application in the field. The Hosiers' farm was therefore concentrated on cropping (with emphasis on corn growing), and an ambitious series of field trials with fertilizers was carried out. At the same time they maintained a dairy herd.

Arthur Hosier seized every opportunity to widen his field of work and increase his knowledge. It is interesting that during this period he discovered in himself a natural talent for water-divining, and successfully located water and laid on distributed supplies by contract whenever he had the opportunity. The years 1911 to 1913 saw two additional farms taken over—a tribute to the profitable enterprise of the first farm.

Farming with foresight

The 1914–18 war was the turning point in the fortunes of this farming system. Corn was scarce and the price rose to heights hitherto undreamt of, together with all classes of livestock. The Corn Production Act appeared to safeguard the future, but Arthur Hosier was not alone in doubting whether in fact the guarantees of high prices in Britain would be maintained when ample food returned to the world and the competition of manufactured exports became of economic importance again. He was one of the few who concentrated on the evolution of a possible alternative system. Therein lay his capacity to think ahead and, indeed, his outstanding contribution to the agriculture of this country.

Arthur Hosier—a photograph taken in the early 1950*s*

The sudden repeal of the Corn Production Act brought disaster to many farmers. Large areas of land which had been brought under the plough during the war were laid or fell down to grass. This in turn resulted in a very large increase of milk production and a severe slump in milk prices.

Arthur Hosier did not accept the situation. He acquired premises in London to handle his milk and provided lorry transport from his farms to compete with the established wholesalers. In due course he was able to reach a satisfactory bargain with the London Dairies and safeguard the sale of his milk at a fair price both then and for future years. In 1920 he bought the Wexcombe farms, (1,700 acres) in a semi-derelict condition; and here he has continued to live until this day.

On the major issue of a farm policy to suit the large areas of light land in the South of England and indeed further afield, there was no ready-made answer. A switch to grass reduced direct annual expenditure, but large scale meat production offered little encouragement when price levels of mutton and beef were falling, and the cost of milk production had by some means to be reduced in order to leave a sufficient margin of profit.

Movable bails

It was in 1922 that Arthur Hosier broke new ground. He evolved and built the first movable bail for use at Wexcombe. Fixed bails had been used largely overseas and are now familiar up and down the country in the form of the modern parlour, but the movable bail was an innovation. With four wheels and a drawbar, it could be taken by a tractor anywhere on the farm to the most

suitable grazing and could be moved daily on to clean ground by its horse and milk float with pulley and tackle. One man with a boy to help could milk 60 cows, and they were independent in carting out food and churns and other requirements and in bringing back the milk. Urine and faeces were deposited direct on the land, so there was neither wastage of manurial ingredients nor work involved in muck-handling. Moving the bail and shepherd's hut daily was simple, as was also the erection of a light chestnut pale fence to act as a collecting yard for the cows. By planning the cropping or utilization of the grassland, it was an easy matter to make and stack hay or other bulk food within reach of the milking herd during the winter, so avoiding double carting.

The economic value of the movable bail is perhaps at its greatest on the large upland farms in the southern chalk belt by reason of the saving of transport of all commodities concerned in milk production. This point is the more important because many such farms have been built up in the past with the farm buildings at one end and commonly at the lowest point of the farm.

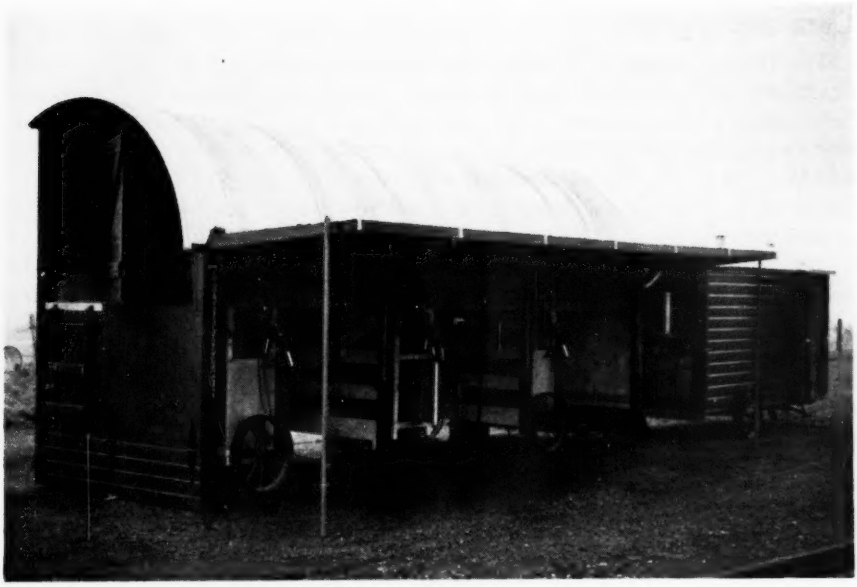
I was fortunate in being taken over to see the first bail in operation and to meet Arthur Hosier, and I have endeavoured ever since to keep in touch with him and benefit from his eminently sane but frequently original and quite unorthodox views. The result of this first visit was that, with Mr. Hosier's permission, we ourselves constructed and used a bail on a farm in South Wiltshire.

Two important factors emerged which were not entirely expected. Firstly, the cows flourished both in winter and summer when running out on upland country, and there was less sickness than when they were seasonally moved from internal warmth to outside conditions, and vice versa. Secondly, the dairymen liked operating this system: no cleaning out and washing down sheds and no removal of manure. Most of their work was confined to the two daily milkings.

Naturally, this new method of milk production aroused considerable interest amongst farmers who, in the depression, were searching for a more economic system of milk production. As a result, Arthur Hosier was soon involved in the business of bail manufacture, which has, of course, continued ever since. In principle, his modern bails have been altered surprisingly little. Originally he installed a pulsator and pipe-line for the milk, which was delivered to the standing churns outside at one end of the bail and cooled at the farm. But before long this was enclosed, a circular brine cooler incorporated, a boiler installed for sterilization and arrangements made for milk recording. Some doubts were silenced when he won the Wiltshire Clean Milk Competition. More recently a second storey, for food storage, has been included over the main bail. The Hosier bail has been copied and adapted successfully by a number of farmers, with the object of providing more shelter for the men or some other objective.

Expansion and consolidation

From 1922 until the Second World War was a period of steady expansion and consolidation for Arthur Hosier. Measured in terms of milking bails, he had increased the number to five in the first eight years, and twelve before the war. Profit was based on economy in improved methods and management, and on an economic level of output in terms of the market price of the time. No cattle were reared, and the cost of replacement stock amounted to little or



Six-stall Hosier portable bail, suitable for 80–100 cows

nothing by the purchase of young in-calf Irish Shorthorn heifers and their sale at an enhanced figure usually after one lactation.

The grazing steadily improved—by organic residues, the use of phosphates and potash, and treading—and it was supplemented and heavier yields for winter bulk food obtained by catch crops such as rye, rape, oats and peas. By then balanced concentrates at a low price had been developed by the oil crushers. Fields were fenced and watered, and the work and labour cost of internal transport and field operations reduced to a low level. So that, although milk prices now appear to have been relatively low, the low cost allowed of a fair margin of profit.

Besides the milking bail, Arthur Hosier originated many minor machinery or equipment innovations, such as the car sweep for haymaking, the bail sterilizer and the multiple use of implements behind one tractor. Success with the milking bail has been widespread, and my personal experience before the last war supports that of many others in that I found a greater profit per gallon of milk from the bail than from a cowshed unit operated concurrently on the same farm.

The nadir of the agricultural depression between the wars was reached about 1930, and from that time the impact of technological work of importance appears to have increased. Robert Boutflour's campaign on the feeding of cows in Wiltshire, the evolution of the ley system together with the new Aberystwyth leafy strains of grasses, the development of the tractor and its implements and the new mechanical farming which began to be practised by farmers in the arable areas, are all examples. The work of the plant breeders throughout Northern Europe should also be mentioned. All these and others made their contribution, but they depended and will always depend on the work of the farming pioneers in order to become incorporated in the farming of the country. Finally, the national necessity for food production during the war, helped by the work of the W.A.E.C.s, expedited progress in all fields of work.

Corn and pasture

The Hosier system of farming was based essentially on specialization and flexibility; no farms could have been more suitable for the growth of corn and subsequently for alternate husbandry. Generally speaking, the land was light, there was accumulated fertility in the turf, the farms were fenced and watered, and laid out in large blocks suitable either for the grazing of bail herds or for cultivation. The period from 1939 onwards was therefore one of rapid expansion.

The simplest assessment of Arthur Hosier's success in farming is that he now owns 13,614 acres of farm land. He himself has passed the age of extreme activity, but of this acreage he continues to farm some 3,000 acres; some 4,500 acres have been handed on to his children, and there is a balance of 6,000 acres which is rented to other farmers. Finally there is his business of implement manufacture. All this has been built up from an initial capital of a few hundred pounds. This achievement is outstanding if, indeed, not unique.

Looking back, it is clear that Arthur Hosier's farming exerted a wide direct influence on the farming of nearly forty years ago. It is not possible to assess its influence on the farming of today, but undoubtedly it has had a marked indirect influence in certain directions, apart from the fact that it is still operated by farmers. In the field of fixed equipment, the fencing and watering of fields, the development of internal roads and the modern yard and parlour owe something to his work, and these examples might obviously be multiplied.

L. G. Troup, O.B.E., B.Sc., has had a long and distinguished career in British agriculture, more recently as Bursar and Director of the Lord Wandsworth College (1948-58) and as Liaison Officer to the Minister of Agriculture (1953-58). He has farmed in Wiltshire and now in Kenya, and he has carried out a number of Commissions in the field of agriculture overseas.

International Congress at Trento

The fifth international Congress on Animal Reproduction and Artificial Insemination is to be held at Trento, Northern Italy, 6th-13th September, 1964. It will be divided into four sections: Biology of reproduction, Jorphology and physiology of reproduction, Artificial insemination, and Pathology of reproduction. The official congress languages will be French, English, Italian, German and Spanish, and papers should reach the Secretary-General not later than the end of April, 1964. His address is Via Monte Ortigara 35, Milan.

Diseased seedling with numerous pycnidia of Septoria apii-graveolentis

CELERY LEAF SPOT and New Seeds Legislation

P. D. HEWETT

UNDER the new Seeds Regulations 1961, buyers of celery seed must be told whether or not it is free from Leaf Spot or whether it has been effectively treated against the disease. It is thus hoped to stimulate the efficient use of control methods and in the end give us disease-free celery crops.

It is diseased *seeds* which are the usual source of celery leaf spot attacks. The cause is a fungus, *Septoria apii-graveolentis*. Plants infected at the seedling stage (when the disease is rarely obvious) act as centres of infection in the transplanted crop. In wet weather the disease spreads quickly, and the presence of just a small number of infected plants can result in considerable damage. 'Spotting' of the leaves reduces yield, and losses are severe if leaves become completely blighted by the fungus. Market prices are poor for heads discoloured by the disease. If infected plants are kept for seed purposes the fungus can grow up the seed stalk and infect the seeds. Germination tests give no indication of the health condition of the seed, and samples with high germination percentages may carry heavy infection.

Because celery production is so specialized and the growing areas and sources of seed are relatively few, control, and even elimination, of the disease should be easier than in the case of most field crops. Previous attempts to combat the disease include the *Clean seed—clean celery* campaign in 1947 which aroused considerable interest. The standard seed treatment then advised —a formalin soak—could not be relied on to kill all the infection but, when followed by frequent copper sprays, clean seed was obtained.

A few years later the hot-water treatment of seed was shown to be fully effective, and the adoption of this treatment resulted in the elimination of the disease from the Lancashire fields. Outbreaks in other areas continued to be reported and sometimes caused severe loss.

The amount of seed infection

Infected seeds carry small black pycnidia, each of which may contain many hundreds of the infective spores of the fungus. Using a good hand-lens, the pinhead-sized pycnidia can be seen quite easily on seeds which have absorbed moisture.

In routine disease tests time does not allow for more than a few hundred seeds to be examined for pycnidia, so this method is suitable only for relatively badly infected samples. To detect low levels of infection, several thousand seeds are soaked in water overnight; any pycnidia present will push out spores, and drops of the water can be examined under a high-power microscope to see if the characteristic spores are present.

Since 1926, at the sender's request, the Official Seed Testing Station has tested samples for this disease and the proportion of samples showing heavy infection over this period has fallen. That these samples were not fully representative of commercial seed became clear during a survey made of all samples received for purity and germination tests during 1953–57. This demonstrated that infection levels in these samples were much higher than in those submitted for disease tests. Some of the infection may not have been alive, but in one year, out of thirty samples examined, at least six contained some viable spores.

This survey has been continued and the results show little change in the situation, although the control methods have been given publicity and certain N.A.A.S. centres did for a time offer a hot-water treatment service to growers. In each of the last few years the fungus has been recorded on at least half of the celery samples received, and about half of these diseased samples contained more than 10 per cent infected seed.

Effect of new regulations

The new Seeds Regulations extend the provisions of the Seeds Act to many vegetable seeds not covered by earlier regulations. Besides providing information about variety or type, purity and germination, etc., in the case of celery seed the seller must state "whether or not the seeds are free from Celery Leaf Spot (*Septoria* spp.)*, or whether or not they have been effectively treated for that disease".

The immediate effect of the new legal requirement is likely to be an increase in the proportion of seed which is hot-water treated before sale. It is known that infection is killed by efficient hot-water treatment, but the standard disease tests at present in use do not indicate whether treatment has been successful. Methods of checking the efficiency of treatment are essential if the legislation is to be effective.

Spores from diseased seeds do not germinate at all readily under laboratory conditions, so lack of germination is not a satisfactory indication of efficient treatment. The spraying of seed-washings containing viable spores on to celery seedlings kept in humid conditions readily leads to infection and the development of typical pycnidia-containing leaf-spots. A routine test is therefore being developed at the Official Seed Testing Station using month-old

*Another species, *Septoria apii*, which produces a large leaf spot with few pycnidia, is also covered by the regulations but is far less common. The foot-rot fungus, *Phoma apiicola*, which occasionally causes quite severe damage, is also seed-borne. Similar control methods are used against all three fungi.

seedlings growing in a cool greenhouse in isolation from outside contamination. Within three weeks of inoculation leaf-spots are clearly visible on the young leaves.

Hot-water treatment correctly carried out has little effect on the majority of samples of high initial germination, but old stocks and seed of low germination may show a considerable drop in the germination percentage. The following table of results obtained on more than one hundred samples treated at Cambridge by the N.A.A.S., gives an indication of the germination losses which are experienced.

Initial germination percentage	*Germination loss* % *samples with germination loss of*		
	3% *or less*	4–10%	11% *or more*
80 and above	60	25	15
60–79	35	35	30

The seller is required to state whether his declared purity and germination percentages are based on tests made before or after the treatment.

Freedom from disease

While much is being and can be done through the control and treatment of infected seed, the production and use of healthy seed from disease-free crops should be the industry's paramount aim.* Clearly, seed treatment is only a means to an end—only one of the control methods for use during the period before the disease is eliminated. During this period special efforts will have to be made to keep field spread of the disease to a minimum.

Plants grown from hot-water treated or *Septoria*-free seed can become infected by spores splashed from old celery debris bearing the disease, and by spores carried from neighbouring leaf-spot attacks on workers' clothes and implements. Spores are not commonly spread by wind. The seedling beds of the Fen celery raisers, containing plants from many seed sources pricked out close together, provide particularly good opportunities for the spread of infection. Careful hot-water treatment of seed followed by regular spraying of the seedlings will be necessary for several years. Seed crops in particular will need spraying regularly at fortnightly intervals.

Elimination of celery leaf spot is possible. It does not require any great expenditure of time or money, although the co-operation of all concerned is essential. Any extra costs of the treatment phase of the operation will be small compared with the annual savings on sprays and dusts that will be made once the disease has been banished from the celery fields to become a laboratory curiosity.

**Report of the Committee on Transactions in Seeds.* H.M.S.O., 1957.

Sydney Moorhouse

Sheep Lore in the North

THE observance of old dates in the farming calendar has declined with changed methods of farming, but so deeply rooted are they in the Northern countryman's way of life that some of them still persist. A good example of this is Salver's Day, (1st November) which is still observed at Wasdale, in the shadow of the great fells of Scafell Pikes and Great Gable. Traditionally, this marks the time of the year when, the sheep having been brought down from the hills, they were smeared, or salved, with a mixture of butter and tar as a precaution against sheep scab.

In the Lake District it has long been the practice to mark any occasion when shepherds and other farm folk get together by a meet of hounds, and the Eskdale and Ennerdale pack, founded in the 1850s, was always about the head of Wasdale on Salver's Day. Even when the then Board of Agriculture issued its compulsory dipping order in 1905 and salving was discontinued, the hunting side was maintained. The Salver's meet at Wasdale at the beginning of November is still a regular feature of the Eskdale and Ennerdale Hunt's winter programme.

Shepherds' meets

If salving is no longer continued, another practice association with the autumn gathering of the flocks is still kept up. This is the custom whereby any stray sheep are taken to certain communal centres to be sorted and invariably claimed by their rightful owners. These events, known as shepherds' meets, are regular features of the Lakeland calendar, although the actual number of stray sheep is nothing like as big as it was fifty or sixty years ago.

It is, of course, during the autumn-gathering that the flockmaster notices that some of his own sheep are missing and that he has several of his neighbours' among his own, and formerly, before the days of the telephone and the motor car, the obvious solution was for farmers to set up collecting centres to which the wanderers could be taken on specified days. A writer describing the Ullswater valley in 1790, says: "There is an agreement between Patterdale, Matterdale, and Legberthwaite to meet on St. Martin's Day to exchange their

Which is mine?

strayed sheep; every farmer bringing those which do not belong to him; no other expense is thought of, but the general one incurred by feasting on roast geese and ale". A later writer in *The Shepherd's Book*, (1817), which gives the various flock marks for Westmorland sheep farms, says: "All stray sheep shall be proclaimed at the Church on Sunday and at the two nearest market towns by bellman on market days".

Today, the principal Lakeland meets fall later in November than St. Martin's Day, but the old atmosphere has been retained. Two of them, Troutbeck, near Windermere, and Bampton, in the Haweswater valley, which is always known as the Mardale meet, are really offshoots of a much older meet held at a height of more than 2,500 feet up on the High Street range of mountains, but in 1835 this was discontinued, the shepherds on the western side of the watershed repairing to the inn at the summit of the Kirkstone Pass and those on the east to the Dun Bull at Mardale, now submerged under the lake-reservoir of Haweswater.

Most of the strays are claimed on the spot, but often there are one or two left over which no one has been able to identify. Such unclaimed sheep can, in accordance with an old tradition, be kept by the organizing committee for a year, and then, if their owners have not been found, they can be sold and the proceeds set against the expense of holding the meets. It is only rarely, however, that this final step is necessary, for even if the owners are not present to identify their sheep at the meets, the markings indicating the ownership of the flocks are well known.

Other similar meets are held elsewhere in the North, and in the Peak District there is one at the Cat and Fiddle Inn, 1,600 feet up on the high moors

of Macclesfield Forest and between Buxton and Macclesfield, when the work at the sorting pens is followed by a traditional supper presided over by the Chief Shepherd.

Flock markings

The various flock markings are much older than the meets themselves, and, indeed, the Lakeland term 'lug-mark' is claimed as a corruption of the Norse *lug-mark*, pointing to the days when the Norsemen settled in this area. The lug-marks consist of notches and cuts in the ears or horns of the sheep, as well as other signs—smit-marks—dyed or 'smitten' on the fleeces. By varying the markings, it is possible to identify hundreds of flocks without repetition.

Almost contemporary with the establishment of the shepherds' meets were the earliest attempts to place the marks on permanent record by publishing guides to those used in different districts. The first of these was the *Shepherd's Book*, already referred, and two years later a similar guide to the Swaledale flocks of an area which stretches over the Pennine fells from Geltsdale to Stainmore made its appearance. Today, what might be regarded as standard guides are those published to cover the Pennine fells in 1936, and *Lamb's Shepherd's Guide*, compiled by the late R. H. Lamb, of Caldbeck, in 1937, which includes the Lakeland flocks of all breeds.

Sheep counting

One of the most interesting survivals concerns the quaint numerals used in counting sheep. It is claimed that these originated in the days when the Celtic shepherds, looking after the flocks of their Scandinavian and Norman masters, still retained their own tongue, and the terms were handed down from generation to generation. In his *Striding Dales*, the late Halliwell Sutcliffe describes how he heard a shepherd using some of the old words on the slopes of Penyghent, above the upper reaches of the Ribble, and gives the set as:

1. Een
2. Teen
3. Tethera
4. Fethera
5. Fip
6. Obera
7. Dobera
8. Eendie
9. Teendie
10. Tetherarie
11. Eenabump
12. Teenabump

Another great authority on Northern lore, the late W. T. Palmer, gave those used in the Lake Country as:

1. Yan
2. Tyan
3. Tethera
4. Methera
5. Pimp
6. Sethera
7. Lethera
8. Hovera
9. Dovera
10. Dick
11. Yan-a-dick
12. Ytan-a-dick

Allowance has, of course, to be made for localized pronunciation, and the fact that for nearly 2,000 years they have been preserved only by word of mouth.

Ivor Brown, in his *Heart of England*, sees in them a possible relationship to the Greek. Are they, he asks, "a legacy of the Mediterranean colonists who preceded the Celt upon the English hills? To what extent are they a relic of the Romans, many of whose auxiliaries were Greek speakers?"

Bloom dips

Today, the use of the 'bloom' dip is frowned upon by wool marketing authorities, but even yet it is the custom to show Herdwick sheep at some of the Lakeland events with their fleeces liberally treated with Venetian red or 'rud' the ordinary Cumberland iron ore, which produces a wonderful assortment of colours, ranging from plum to pink, to contrast with their white faces. The practice would seem almost as old as the Herdwick itself, and its origin is no clearer defined. Years ago, the late John Hawell, whose sheep runs extended over much of Skiddaw Forest, was asked the reason for this. He replied that just as the red-coated soldiers preserved the country's freedom so did the red-fleeced Herdwick preserve the freedom of the Lakeland Hills! The Herdwick breeders have, however, failed to follow the lead of the War Office in changing the 'battledress' of the soldiers; and it is perhaps significant that today the Swaledale and other mountain breeds roam many of the hills where the Herdwicks once reigned supreme.

Sydney Moorhouse, F.R.G.S., F.Z.S., is an agricultural journalist and broadcaster. He is specially interested in country life, and has written a number of books on rural subjects.

Condensation can cause a lot of trouble and discomfort to cowmen and cows alike. **J. F. HOARE,** *of the Agricultural Land Service, Nottingham, offers a few suggestions in answer to the question—*

Does Your Cowhouse Drip?

PROBLEMS of condensation in stock buildings increase year by year. Occasionally they become so severe that a building can become almost unusable. Why? Our ancestors seem to have had little or no trouble with condensation. It seems to be a twentieth-century evil.

The older type of buildings put up last century are invariably warmer and drier, even allowing for the greater use of lofts. Dripping from the roof hardly ever occurs where the roof is tiled or slated, but once galvanized iron or asbestos is used, the whole shed drips—into the mangers, the hay in the feeding passage, on to the cows' backs and even into the bucket. In really bad

climatic conditions the inside of a cowhouse can be as steamy as a Turkish bath. Even the milder cases are uncomfortable for the cowmen (and the cows), feedingstuffs are spoiled, and the roof timbers suffer considerable permanent damage.

There really is no 100 per cent cure for getting rid of condensation. Success depends on many factors such as the design of the building, its shape and its siting, i.e., whether the sun ever gets round to it or whether it is in partial or total shade most of the winter months. Whatever is done must be on the basis of trial and error; there are no infallible rules, but the following suggestions are certainly worth trying.

Roof ventilation

As a start, see if you can put in more outlet ventilation high up in the roof—at the ridge if possible, otherwise in the gable ends. In some way the warm, moist air must be got out of the building before it becomes chilled and condensation results. If the roof has an ordinary double pitch with a ridge in the centre, take off the whole (or a good part) of the ridge-capping pieces. You will be surprised how little rain actually does come down through the gap that is left, and any very small down-draught which you might get occasionally is a small disadvantage against the clouds of moist air which you get out. If there is no ridge (e.g., in a lean-to), put in some hopper-type opening windows high up in each gable wall.

Washing down

Try to prevent washing water and urine from lying in the dung channel—in fact anywhere in the shed—and make certain it will run away quickly to the drains. Half the trouble in cowsheds is undoubtedly caused by lying water and the other half by the habit of many cowmen in the two- or three-minute morning hosing, when the tap is turned and left on or hundreds of gallons of water are squirted all over the place like a fireman damping a fire! Some water for washing down obviously has to be used, but there is no need for it to be excessive. As a further measure to reduce the amount of lying water, why not use ground limestone in the channels and passage ways? It is very cheap, absorbs moisture and is useful on the land too.

Insulation

As a third measure, where the building is so sited that exit ventilation is extremely difficult, some form of insulation attached to the underneath of the spars or purlins carrying the sheeting might well help. Any form of insulation used *must*, however, be properly sealed with a vapour seal, otherwise it absorbs moisture and, apart from sagging or falling to pieces, it loses its insulating properties. There are some very good insulating materials on the market now, and they are not all that expensive either.

Lastly—and this really is a possible remedy only if all else has failed—it may be necessary to install some form of mechanical ventilation system such as a fan.

If you have a condensation problem, some of these methods used by dozens of farmers may help considerably. But if you are thinking of re-sheeting an old tiled or slated roof, try to ensure that you will not be plagued by condensation *afterwards*. A bit of advice beforehand is worth a lot of dripping!

51. Solihull, Warwicks

J. B. Hill

THE Solihull district, consisting of 65,000 acres, is situated due south of Birmingham, running to within a few miles of Stratford-on-Avon and stretching from the Worcester county boundary on the west to the city boundary of Coventry on the east. There are no natural geographical boundaries to the district and no major rivers, as both the Blythe and the Arrow run for only comparatively short distances within the area.

The countryside is very pleasing to the eye, being well wooded and gently undulating. It rises from 100 to 400 feet as the city of Birmingham is approached. Of several picturesque hamlets and villages, Henley-in-Arden, with its attractive main street, is the largest, although Stratford-on-Avon is perhaps the natural market centre for much of the district. The Forest of Arden is now conspicuous by its absence. Henley-in-Arden, well known over a wide area for the excellence of its ice cream, also has a useful market, particularly for poultry, which attracts entries from well outside the county.

The area was glaciated in the past, so that some soils bear little resemblance to the underlying geological formations. Soils of mainly drift material vary from light sandy loams to sticky red clays, generally overlying keuper marl, which often outcrops on the tops of the banks and hills. An area of medium to light soils derived from the bunter sandstone is found on the Coventry outskirts. Drainage is a problem where clay soils predominate, particularly in the western part of the district.

With a rainfall of 26 inches, no major river systems, and piped water not always available, it is difficult to provide some places in the district with an adequate water supply for farming purposes. During the dry summer of 1959 wells dried up and water had to be brought in for distances of up to two miles in some parts.

Besides the usual problems associated with soils and climate, farming in the district is beset by two major man-made hazards, namely, the small size of the farming units and the close proximity of industry. The large estates in the area broke up many years ago, and from local information it appears that much land was sold attached to existing cottages. Combined with the dividing up of the commons, this resulted in a patchwork of small holdings which have increased to their present size by the acquisition of fields as and when available. Bad farm layout is thus very noticeable in places. Buildings for the same reason are often inadequate. Even today, out of 1,200 holdings, only 650 are over 15 acres.

The area is not suited to intensive arable farming, and although a considerable acreage of cereals is grown, the acreages of sugar beet and potatoes

are small. It is predominantly a livestock area, and naturally the dairy cow prevails as practically the only means many of the smaller farmers have of obtaining a living. This means that the district is mainly under grass, and the efficiency with which it is managed and utilized varies immensely. Many small farms still grow a few acres of cereals, as much for the straw bedding obtained as for the grain produced.

On a lot of these holdings, ingenious means have been used to enable an adequate number of cows to be housed and milked. On other holdings where milking is not permitted, corn, beef and sheep enterprises have been evolved, generally supplemented by intensive pig and poultry units. One advantage is that there is a ready sale for poultry produce at the farmhouse door.

The fundamental effect of nearby industry can clearly be seen on the farming pattern, primarily through its influence on the price of land and labour. As the price of land is high, intensive farming systems are necessary if a living is to be obtained, with a corresponding need for a high level of working capital. Thus, few farmers are in a position to expand their businesses by the acquisition of additional acres or to help set up their sons in farms of their own. The competition for land is intense, and is aggravated by the steady influx of those who work in the city but wish to live in the country. A considerable number of industrialists live and farm in the area and their number is increasing, again constantly adding to the pressure on what land is available. Many of these industrialists spend considerable sums on buildings and equipment to make their holdings efficient units, but it does not necessarily follow that an intensive farming system is adopted, and it is not unknown for an extensive system of husbandry to be practised. Thus, in some instances, the farming programme bears little relationship to the high capital values often involved.

Industry also adversely affects the supply of farm labour in the area, making it both scarce and expensive. To obtain a skilled workman, well over the minimum wage must be offered, and in all cases good quality accommodation must be available. Good cottages are few and far between, and not many farmers on the smaller holdings can afford to build new ones. The trend is, therefore, for these holdings to be organized in such a way that they can be run solely by family labour. Farms between 70 and 150 acres are generally most affected by the labour situation, and their reorganization mainly consists of streamlining the farming system by cutting down the number of enterprises and specializing on only one or two lines of production. To some extent the shortage of good quality labour is more apparent than real in that, even if it was available, many occupiers could not find the weekly cash to pay for it.

Other effects of industry can be seen besides those already noted. When land in the area is sold, it is often sub-divided, so that the movement towards larger farming units is slow. Occupiers on the smaller holdings of 35 acres and below are taking jobs in local industry and running their farms on a part-time basis at lower levels of intensity, by substituting beef or sheep enterprises in place of dairying. Sociologically, the result of all these changes is that in little of the district can there be said to be a purely rural farming community.

In all, it is an area of great scenic charm, close to the amenities of urban life, with a wide diversity of outlook and upbringing among its inhabitants, resulting in considerable variations in the farming patterns evolved.

H. HARLAND
Agricultural Land Service, London

Finance for Fixed Equipment

THE temptation to rush into improvement schemes without adequate forethought should be resisted at all costs. Any improvement must be capable of paying for itself, and the scale and combination of farm enterprises must be right for the period ahead. Capital converted into buildings cannot be reconverted, nor can mistakes in siting and layout of fixed equipment be easily rectified.

In assessing the capital needed, it is essential that *all* items of cost are included. Difficulties and added expense may occur if extra capital has to be raised later. For contract work, two or more estimates should be obtained, based on the same specification and plan. Allowance should also be made for the fees of any architect, surveyor, or other adviser and the legal or other costs of raising any necessary loan.

The capital required will normally be the balance of cost after allowing for any Government grant. For most farm improvements, grants are available at rates between one-quarter and one-half of the reasonable cost. The construction and modernization of farm and horticultural buildings, improvements to roads, bridges and rural dwellings, the supply of water and electricity are examples of improvements which qualify.

It may be possible to raise the balance of capital from private means, e.g., stocks and shares, building society investments, land and timber. The alternative is to borrow the money, and the course adopted will depend very much on individual and other circumstances, such as current yield on investments and interest rates on borrowed money. Where large sums are involved it is prudent to seek professional advice.

The principal ways of borrowing available to a landowner or owner-occupier are by either an improvement loan or mortgage.

Improvement loans, which can be obtained from the Lands Improvement Company or the Agricultural Mortgage Corporation, Ltd., are a special form of loan made against the security of a rent-charge on the land being improved. Most long-term improvements on agricultural property are eligible up to the full cost of the works. Before improvement loans can be sanctioned, three conditions must be fulfilled. First, the improvement must increase the net annual value of the land by an amount exceeding the annual rent-charge. Second, the increase in the capital value of the land arising from the improvement must exceed the total sum borrowed. Third, specifications and plans must be approved before work is started.

Compared with other kinds of long-term borrowing, improvement loans have certain advantages. Repayment of the loan, including capital and

interest, is made in half-yearly instalments over a period fixed according to the expected life of the improvement but never exceeding 40 years. The loan is thus extinguished by the time the value of the improvement is exhausted. Deposit of title deeds is not required. Loans cannot be called in during the loan term and the interest rate is fixed for the whole period. They may be obtained even if the land is already mortgaged, and the owner is not prevented from raising a mortgage subsequently or obtaining further improvement loans. In the event of a sale, the rent-charge is automatically transferred with the land and the land may be let or sold without the consent of the lending company.

Loans on mortgage differ in some important respects. They are made against the security of a freehold or leasehold interest in property, and under the mortgage deed a legal interest is conveyed to the lender, who holds the title deed. Certain restrictions are imposed on the owner under the mortgage deeds. The power of disposal without consent is limited, and in the event of breach of covenant or failure to make the repayments of capital and interest when due, the borrower may be required to pay off the whole of the loan and interest outstanding.

Up to two-thirds of the value of the property can normally be borrowed by way of mortgage and the money obtained can be used for any purpose the borrower wishes.

The Agricultural Mortgage Corporation offer special facilities for estate and farm owners. Loans may be advanced on first mortgage for periods of from 10 to 60 years at a fixed interest rate and repayable in half-yearly instalments.

Some insurance companies loan money on mortgage. This is usually effected in conjunction with an endowment policy on the borrower's life which, when it matures, or on the earlier death of the borrower, repays the loan. Other sources of mortgage loans are solicitors, banks, mortgage brokers, friends and relatives.

For the owner-occupier or tenant farmer, medium or short-term credit is available through the Agricultural Credit Corporation, Ltd., banks and hire-purchase companies. With the Agricultural Credit Corporation, the arrangements are that the farm improvement programme is first drawn up and agreed with the Corporation, who then negotiate a loan with the farmer's bank and act as guarantor for the whole of his borrowing.

Bank loans are normally approved only on a short-term basis and some collateral security is often required. Borrowing from a bank is one of the least expensive methods and is particularly useful as a temporary expedient when interest rates on long-term loans are high. When interest rates fall, the short-term borrowing can be transferred to one of the longer-term mortgage sources.

Loan or mortgage interest attracts income tax and surtax relief and there are other important tax concessions. Under the capital expenditure claim, tax allowance is given to an owner or tenant on one-tenth of the net expenditure of specific agricultural and forestry improvements (but limited to one-third of the net expenditure in the case of farm houses) in each of the ten years following that in which it is incurred. The allowance is normally given by relief from, or repayment of, tax on agricultural income, but a claim to have it set off against other income may be made within two years of the end of the year of assessment concerned. There is also a special investment allowance,

given only in the first year after that in which the expenditure is incurred. Thus it is possible to recover tax on eleven-tenths of the net cost over the ten years following the completion of eligible work.

In certain circumstances, expenditure incurred by an owner in replacing fixed equipment may qualify for tax relief under the maintenance claim. This relief is spread over five years, but expenditure admitted under this claim cannot also be included in a claim for capital expenditure allowance.

Further information on this subject is contained in Fixed Equipment of the Farm Leaflet No. 2, *Financing Improvements to Land and Buildings* (H.M.S.O., price 1*s.* 6*d.*, by post 1*s.* 9*d.*)

Agricultural Chemicals Approval Scheme

Additions to the 1962 List of Approved Products

THE following additional products have been approved under the Agricultural Chemicals Approval Scheme. The Second List of Approved Products was published on 1st February, 1962.

INSECTICIDES

GAMMA-BHC (LINDANE)—*Wettable Powders*

Gammacol (formulated as a liquid suspension)—Plant Protection Ltd.

FUNGICIDES

ZINEB—*Wettable Powders*

Murphy Zineb—Murphy Chemical Co. Ltd.

COPPER WITH MERCURY

A combined copper-mercury fungicide for control of potato blight.

Wettable Powders

M.C.O. Dispersible Powder—F. W. Berk & Co. Ltd.

ZINEB—*Dusts*

Murphy Zineb Dust—Murphy Chemical Co. Ltd.

HERBICIDES

DINOSEB (DNBP)—*Formulations in Oil*

Pulvicide-B—Vitax Ltd.

DALAPON—*Sodium Salt Formulations*

Baywood Dalapon—Baywood Chemicals Ltd.

The Ministry's Publications

Since the list published in the June, 1962, issue of *Agriculture* (p.138) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops (addresses on p. 204), from any Divisional Office of the Ministry or through any bookseller at the price quoted.

BULLETINS

No. 185. A System of Turkey Breeding (New) 3*s.* 6*d.* (by post 3*s.* 10*d.*)

This bulletin is intended mainly for practical turkey breeders who are anxious to improve the overall economic merit of their stocks. Problems discussed include the introduction and testing of new strains, selection for fecundity, selection for body size and maintenance of records.

LEAFLETS

Up to six single copies of Advisory leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 6d.).

ADVISORY LEAFLETS

No. 409. Stem Eelworm on Clover (Revised)

No. 334. Pea Moth (Revised)

No. 258. Ropy Milk (Revised)

FARM MACHINERY LEAFLETS

No. 26. Machinery for Swath Treatment of Hay (New) 6*d.* (by post 9*d.*)

OTHER PUBLICATIONS

Diseases and Pests on Horticultural Planting Material (Revised) 12*s.* (by post 12*s.* 6*d.*)

A guide to the recognition of diseases and pests on dormant or semi-dormant planting material. Intended primarily for officials who inspect plants for import and export, it should also be of value to professional and amateur growers and to teachers and students. Indexed and illustrated.

Experimental Husbandry No. 7. (New) 7*s.* (by post 7*s.* 6*d.*)

Contents include: Effect of irrigation on sugar beet and potatoes. Placement of fertilizer for sugar beet. PCP as a pre-emergence chemical treatment in the control of weeds in kale and turnips. Mecoprop and a mixture of MCPA and 2,3,6-TBA for the control of weeds in cereals. Progeny testing of beef bulls used in natural service. Feeding supplementary concentrates to dairy cows on grass during May and June. Outwintering beef cattle. Management of ewes and lambs on grass. Housing of deep litter poultry. Phosphate experiments on restored opencast coal soils.

Smallholdings organized on the basis of Centralized Services, 1960-61. 3*s.*

IN BRIEF

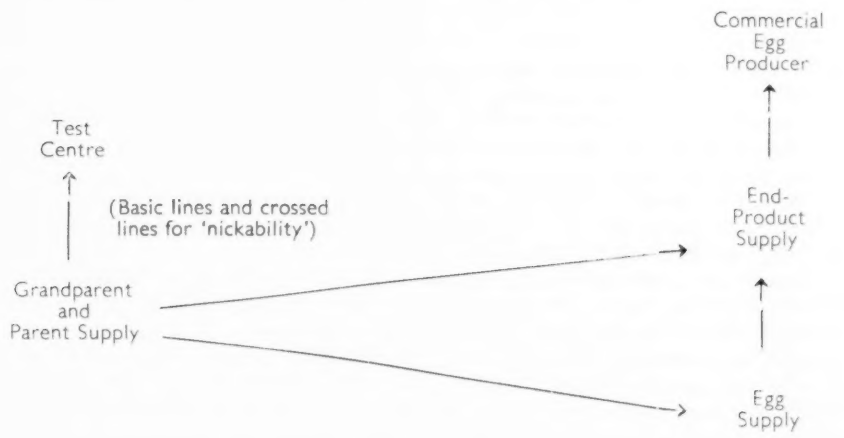
Co-operation among Small Poultry Breeders

In the opinion of Mr. R. Smith, farming at Clevely Mill, Farton, Lancashire, competition in chick production, already intense, is likely to become more so as the bigger hatchery organizations continue to take more of the trade. This trend, he says, is aggravated to some extent by the fact that the small poultry breeders' customers (usually the smaller poultry keepers) are feeling the pinch from lower egg prices. But within the industry there are the breeders and the stock to meet increasing competition if they are prepared to get together.

Large concerns are spending a lot of money in research, including testing programmes. Mr. Smith does not consider that under modern conditions it is possible for individual small breeders to undertake successfully the whole operation of breeding from the pure-bred pedigree stage to the production of the commercial end-product. He envisages that breeders might co-operate with each other by grouping within defined limits, and such a scheme, which could be organized to take full account of individual preferences, might well be the best answer of the small breeder to the challenge.

It would include pedigree breeders concentrating solely on the production of grandparent and parent strains, these being strains *test mated* on grandparent and parent supply farms. The resulting cross-bred product could be tested at a neutral test centre, where also grandparent and parent lines of pure-breds could be tested in order to get a wider picture with regard to disease resistance, etc., which might be overshadowed on pedigree breeders' own farms.

Mr. Smith thinks the set-up might be:



Superior strains, as proved by performance and 'nickability', would then be distributed to end-product suppliers who would hatch the commercial chick, taking in additional egg supplies as required from hatchery supply flocks. The test centre would be the key-point of such a scheme, and Mr. Smith suggests that one of the existing Poultry Progeny Testing Stations might well be acquired for this purpose.

Finance might come by a levy system on chick sales. The amount would depend on the number of stock over which the load was spread.

As for organization, the initial stages would be the main hurdle. A good leader would be vital for success.

Capillary Watering of Pot Plants

The need for hand watering has always made the growing of pot plants a costly business, especially at weekends and holiday-time. Attempts to modify the various types of trickle irrigation system used for plants growing in soil have not been successful.

Development work at the National Institute of Agricultural Engineering has, however, led to the development of a system which gives every indication of having solved the problem. It employs the principle of water moving up, by capillary attraction, through a shallow bed of clean sand. This bed of sand, which must be of the correct grade, forms the bench on which the plants are placed. The water enters the pots through the drainage hole and is replenished from the reserves in a header tank.

All the species of plants so far tried have grown successfully under this system. It offers great possibilities for such plants as cyclamen and *cineraria solanum*—indeed, for any of the usual plants grown for indoor decoration.

The first precaution is to water any freshly-potted plants from above with a watering-can until full capillarity is established. The second essential is that the drainage hole in each pot must be plugged with glass wool, to establish a capillary connection between the water in the sand and the soil in the pot.

Full details of the method of constructing the bench are given in a free leaflet (STL 16), available from the Ministry of Agriculture (Publications), Ruskin Avenue, Kew, Richmond, Surrey.

Salt Poisoning in Pigs

It is probably not generally realized that salt can cause serious trouble amongst livestock, especially pigs. The amount of salt in the body is readily controlled in all animals and man provided they have free access to both salt and water. Intensively-kept animals depend entirely on their human masters for their food and water supplies, and in conditions where the salt content of the food is high and the water intake is restricted salt poisoning can occur. The form most commonly seen in pigs is chronic salt poisoning, so called because of the slow accumulation of salt in the tissues over a number of days. The appearance of the disease, however, is nearly always sudden. Heavy losses can occur, especially in store pigs, and it is invariably associated with restriction in the water intake.

Household swill is a common source of excessive quantities of salt, but home-mixed meals sometimes contain very high levels. Nowadays, proprietary meals can rarely be implicated as the source of too much salt.

Even when excessive salt is present, trouble may not be experienced until, for instance, the relief pigman forgets to water a pen of pigs at the weekend, or frozen pipes stop the water supply to the automatic bowls. Under such circumstances it is believed that the excess salt is stored in the body tissues, including the brain, and when the pigman remembers about the pen, or the pipes thaw and plenty of water becomes available, the various tissues take up the fluid and this causes waterlogging or oedema. When the brain is involved in this way, signs of severe nervous derangement develop. Often the first signs seen in pigs are itchiness, constipation and excessive thirst. These signs are followed by blindness, deafness, walking backwards or sitting with the head held in the air, and intermittent convulsions, when champing and frothing at the mouth are common. The pig may die in one of these fits in a few hours or as long as 3–4 days after first showing signs.

Because giving water precipitates the signs of salt poisoning, treatment is rather difficult and not always successful. Of course, the salty food or water should be

withdrawn immediately, but access to fresh water should be restricted at first. Sedatives may be given to pigs showing nervous signs, but response to treatment is usually disappointing. Treatment of any condition should naturally always be based on an accurate diagnosis, and this applies no less to salt poisoning than to any other disorder—indeed probably more than most, for in many ways the signs resemble an attack of swine fever.

Your veterinary surgeon, who has the services of a state laboratory organization available to him, is the only person qualified to give the quick and accurate diagnosis which will save your pigs and your money.

Prevention is always better than cure, and in this condition it is relatively easy. First ensure that growing pigs have an adequate intake of fresh water; if *ad lib.* feeding is adopted, make sure there is also *ad lib.* water. Secondly, ensure that diets fed to pigs do not contain more than 1 per cent salt.

Salt poisoning is a condition which, under adverse conditions, can cause severe losses in growing pigs, but which with good management and a little care should never be experienced on the modern farm.

J. B. Spence

M.M.B. Artificial Insemination Progress

Information from the Milk Marketing Board shows 1·7 million cows to have been inseminated at their twenty-three centres for the year ended March, 1962. This is 5 per cent up on the work for the previous year. If the Associated A.I. Centres group is added, the total inseminations are well over 2 million in England and Wales.

Compared with 1960–61, there was a slight decrease in the number of dairy breed inseminations (1·1 per cent), entirely from Friesians. The others, particularly the Channel Islands breeds, showed an increase. All dual-purpose types, except Welsh Black and S. Devon continued to decline.

The insemination of beef breeds was up by 30 per cent on last year, with the Hereford outstanding. This breed now accounts for one-fifth of all inseminations.

The total paid inseminations for all breeds during 1961–62 was 1,699,172, of which 1,007,856 were for dairy and 599,675 for beef breeds.

Charcoal

Charcoal plays an important part in many present-day manufacturing processes. In the past its most important use was as fuel, for it gave a more intense heat than could be achieved by any other means, from a fire that was almost smokeless and easily controlled. The use of charcoal is at least as old as the use of metals, and it is only in comparatively recent times that coke has replaced charcoal as a smelting agent in this country. In Sweden, at the present time, the production of iron and steel is still largely dependent on the use of charcoal.

In Britain large amounts of charcoal are used in the manufacture of case-hardening compounds for ferrous and non-ferrous metals, as a filler in rubber goods, paints and plastics, and as a heat insulator in refrigerators and vacuum flasks. It will absorb gases and so is used in acetylene cylinders and other gas containers and light buoys. It likewise absorbs odours, and is used in deodorants. Other uses for charcoal are found in the making of cyanides, glycerine and electrical batteries. There is a large demand for charcoal for use in the manufacture of carbon disulphide, which is used in many chemical processes, and especially in the artificial silk industry; beech charcoal is especially suitable for this particular purpose. Charcoal dust is a useful soil improver. As an absorbent of gases it is made use of in medicines, and home-produced charcoal refined for pharmaceutical purposes is exported in some quantity.

Charcoal is still used as a fuel, for specialized forms of cooking and heating—barbecues will immediately come to mind—though its price is roughly three times that of coal.

Charcoal is made by heating wood under conditions where there is insufficient air for complete combustion. The water contained in the wood is driven off, first followed by the volatile compounds, including creosote and tar. This leaves behind a residue of solid black carbon, together with a little mineral ash. At one stage more heat is produced than is absorbed, and this explains how a small fire lit at the heart of a heap of wood can cause the whole to become charred, although only a small fraction is actually burnt up.

Three methods are used today to manufacture wood charcoal: earth kilns (very rarely), portable kilns, and retorts. The main species of wood used are beech, birch, oak and ash, together with a small quantity of other broadleaved species, and mixed conifers.

The bulk of the demand in this country is for broadleaved charcoal; the markets for coniferous charcoal are limited and have not, in the past, been available to home producers. Recently, however, very small orders for home-produced coniferous charcoal have been secured, and the indications are that one or two firms may find it worth while to produce limited quantities of this material. It is unlikely though that the demand for coniferous timber for charcoal manufacture will increase in the future.

More information on this subject is given in the Forestry Commission's Forest Record No. 19, price 3*s*. from H.M. Stationery Office.

Testing Dairy Bulls

The work which B.O.C.M. has been doing over the past eight years in the progeny testing of dairy bulls is described in a usefully illustrated brochure. Over this period 56 bulls, comprising Ayrshires, Friesians, Dairy Shorthorns and Guernseys, have been group tested at the Barlby and South Cathkin Farms. The heifers are brought in just before calving and fed, managed and milked under standard conditions for an average lactation of 270 days.

By meticulous recording, not only of milk yields but of butterfat, solids-not-fat, speed of milking, liveweight changes and temperament, much of the guesswork of a sire's potentialities is removed.

This is an interesting story and one, which by its implications, is of paramount importance to every milk producer.

If you are Farm-Storing your Grain

Before you put your hard-won grain into store, it's worth while taking a look at the building you propose to put it in. Buildings have a habit of deteriorating, and that can spell trouble from rats, mice, birds, insects and mites. Between them they make up a formidable enemy—and there is little comfort to be derived from the philosophy that they are merely following their natural line of behaviour.

Look for holes in the brick-work, stone or concrete floors; anything bigger than $\frac{1}{4}$ inch should be filled in. Air-bricks and ventilators can be fitted with $\frac{1}{4}$-inch mesh screens. All brick and concrete surfaces should be smooth and without cracks or even pin-point holes which are ready-made quarters for insect life. Electricity wiring and water pipes should be close fitting at their points of entry. The roof should be sound, and see that the walls go right up to the underside, to stop birds and mice getting in that way.

Steps and thresholds should either be level, so that there are no gaps under doors, or a fillet fixed, against which the door can close snugly.

If you had any trouble from insects last year give your granary an extra thorough clean, and spray it with a suitable insecticide.

And when 'all is safely gathered in', keep the store clean and tidy. In this way you can be reasonably sure of taking out *all* you put in.

Books

The Symbolic Pig. F. C. SILLAR and R. M. MEYLER. Oliver and Boyd. 63*s*.

How can a writer review a museum? This book is nothing less. Here is enshrined a great wealth of examples, ranging over 2,000 years of the world's history, of man's sacred and profane response, in legend, literature, art and craftsmanship, to the charm of pigs.

Here is escape indeed from the captiousness and competitiveness that mar any current consideration of this animal. What a relief to read of the pig without the discord of controversy—no claims for breeds save that for the poetry of their names; no mention of price or profit; no science nor husbandry. Instead, the magic of Durer's woodcut line, the rich cathedral colouring of a thirteenth century bestiary, the cool curves of a Grecian vase, the deep emotive prose of Thomas Hardy, the disturbing irony of George Orwell, the satire of Shelley, the solid commonsense of G. K. Chesterton, and, most splendid, most sustained of all, the bounteous harvest of medieval craftsmanship, by which stone-masons and woodworkers portrayed pigs in every shape, form and fantasy to the glory of God.

To browse in this work, and browsing befits the ease in which the authors wear their scholarship, is to make a voyage of discovery, or maybe of re-discovery, for it is well to be reminded of Chesterton's revelation that 'the beauty of the best pigs lies in a certain sleepy perfection of contour which links them especially to the smooth strength of our south English land in which they live'.

The most fascinating section of all perhaps is that devoted with much zeal to the ecclesiastical pig—the pig that figures so prolifically on the misericords, pew-ends, choir stalls and corbels of our medieval country churches. Already their recorded population is high—but the publication of this book will assuredly inspire many visits for research—and inevitably prompts the question, why? Why was the pig the chosen animal to be displayed in so many guises—playing the harp, the bagpipes, the fiddle, jousting, wearing trousers, dancing, even bearing riders?

Some find the answer in moral implications, others in symbolism. May not the answer lie very simply in the plain fact that the artisan and the peasant of that time relied almost entirely on the pig for the animal protein that meant life? The pig was the converter of the wild fruits of the woods and forests. Bacon was almost the sole meat ever on the peasant's table. As such, the pig was loved, and there should be little surprise that in the uncomplicated ways of medieval artisans such love was translated into the greater love that inspired their worship.

It is indeed probably a continuation of such love that has inspired the devotion and zeal that have gone to the creation of this secular shrine. The authors might bridle at the sound of the word applied to their so highly respected animal, but it must be said, in praise of the printer and publisher of this handsome book, that here the pig truly wallows in luxury. *G.G.*

Britain and the European Community: Background to the Negotiations. C.O.I. H.M. Stationery Office. 3*s*.

This background to the Common Market negotiations provides some much-needed facts and figures. The political and historical aspects of European co-operation are outlined in this booklet which presents, almost without comment, the selected statistics of imports, exports, production and employment which are the essentials of the Common Market issue.

It is easy to forget that the six countries concerned had been acquiring the habit of co-operation since the European Coal and Steel Community was set up in 1951. The description of E.C.S.C. and Euratom is therefore of particular interest. The E.C.S.C. has had wide regulating powers over investment, production and distribution within its limited field since its inception.

The expanding market represented by E.E.C. is illustrated graphically, and Britain's unimpressive showing in this market to date is not disguised. The question of Commonwealth trade is nicely presented, both in general terms (for instance, the present proportions of Commonwealth trade with E.E.C., E.F.T.A. and U.K., together with the fact that the external tariff on most raw materials is nil), and in particular, with the problems of producers of tropical and temperate foodstuffs and the relative importance of these problems to the economies of each country.

In the agricultural sphere the reader is reminded that the support policy of the E.E.C. countries aims at maintaining market prices at levels which give farmers a reasonable return. The objectives are similar to those of our own 1947 Act—to ensure a fair standard of living for the agricultural community, to stabilize markets, and to guarantee supplies and ensure reasonable prices for consumers.

The relative growth of national economies is a vital fact in going into Europe. Here, tables show too clearly that U.K. industry has lagged behind Europe, even in the post-war recovery period of increasing output.

The booklet presents some aspects of European community life which may be overlooked—for example, with free mobility of labour goes the doctrine of equal pay and the evening-up of social security systems; in addition, restrictions on capital movements, including real estate transactions, will disappear.

The lack of a conclusion to the study, though disconcerting to the reader, probably reflects accurately the present state of the negotiations. The man in the street has at last been given a reference which will enable him to clothe his Common Market arguments with facts: it would be unrealistic to hope for more. *S.E.L.*

Weather and Food. A Basic Study by the World Meteorological Organization, Geneva. L. P. SMITH. 2 Swiss francs.

Weather prediction has ever intrigued but baffled mankind, be it approached by the trained meteorologist or by the lore of the countryman. Whether the scientist or the interpreter of signs of nature is the more successful depends on the camp to which you belong.

This booklet stems from the Freedom from Hunger Campaign launched in 1960 by FAO. It is the first of a series of sixteen basic studies, and only when you have read it will you be fully aware of all the hazards that are involved in weather forecasting, of the sometimes stumbling steps being taken to reach the goal of accuracy, and of the immensity of final accomplishment.

Written in simple, non-technical language, it is a fascinating introduction to a fascinating subject. For those tempted to delve deeper, there is an extensive bibliography.

The author reviews the influence of nature on the facts of food production: the influence of day-length; of heat and light; of clouds and sunshine; of rain and snow; of air temperatures; of disasters such as tornadoes, floods, hailstorms, dust storms and fires; of pests and diseases; and of soils.

Britain is comparatively free from major meteorological disasters, but elsewhere they often ravage food production as well as life, and it may take many years to restore a devastated area to full production. China, for instance, is a current example where starvation threatens; and did you know that a hailstorm did such enormous damage in France that it hastened the French revolution?

Much light is thrown on soil erosion arising from misuse of land and the neglect of vital meteorological factors: the rape of the land committed by many races of many ages and in many countries. And so on to a study of irrigation and the proper use of shelter.

What of the future? In addition to foolproof weather forecasting, much can be done to *control* weather; to prevent thunderstorms; to increase or divert rain; to attempt to tip the scales one way or another. New lands can be brought into cultivation; even the sea.

The booklet will not help you directly to put an extra penny in your pocket—but it will make you think. *A.R.*

The Agricultural Notebook (PRIMROSE MCCONNELL, 14TH EDITION). Iliffe. 40*s*.

It is truly amazing how this old favourite keeps perenially young. I see it is eighty years old this year, and might therefore be thought to be getting a little musty. But thanks to the powers of regeneration invested in Professor Ian Moore and his team of indefatigable 'beavers', the *Agricultural Notebook* is of even greater value today than it was when Primrose McConnell conceived it. Science has ousted lore, and the present contributors have the advantage of being able to draw upon a veritable Pierian spring of agricultural research.

Over three generations of farmers have turned the *Notebook's* pages to find the answers to a thousand and one questions which all good farmers should know. As for students, how many, I wonder, owe their diplomas to the multitude of facts recorded in its (now 800-odd) pages?

Those who possess a first edition of Primrose McConnell will cherish it with the fierce affection of a collector of Old Masters, but it's time they got really up to date with this, the fourteenth edition. To those unfortunate people who don't possess a copy at all, I can only say to them get in touch with your bookseller right away.

S.R.O'H.

Agricultural Chemicals: Their value and Safety. SYLVIA LAVERTON. Association of British Manufacturers of Agricultural Chemicals.

The use of chemicals has probably caused as much controversial opinion as any agricultural development of modern times. Mrs. Sylvia Laverton, in answering twenty simple but pertinent questions, sets out to put this controversial subject into its proper perspective, and the booklet should go a long way towards allaying public concern. Even the most captious critic may have difficulty in justifying his anti-chemical attitude when he reads that the alternative is to put in jeopardy the lives of many of the millions of the already underfed in the under-developed countries and to undermine our own living standards. Few probably fully appreciate the many stages through which a new chemical must go before it can be brought into commercial use. The diagram on page 27 traces these stages of development from the time the manufacturer carries out his screening laboratory tests until the chemical is examined and cleared by the Ministry of Agriculture, under its Notification of Pesticides and Agricultural Chemicals Approval schemes.

Reference is made at the end of the booklet to a useful reading list, and anyone having an interest in the use of agricultural chemicals is well advised to get a copy of the booklet. It is free from the Association of British Manufacturers of Agricultural Chemicals, 86 Strand, London, W.C.2.

R.G.

East Malling Research Station Annual Report, 1961. 17*s.* 6*d.*

In 1961, spring frost fell later at East Malling than in any year since the Station was founded. This and the summer drought that followed reduced the apple crops, but soft fruit crops were good, especially black currants. Amos Black and Baldwin black currants gave a total crop of 77 cwt (4·8 tons per acre) in an irrigation and nitrogen fertilizer trial covering three quarters of an acre.

There are some interesting observations of practical value in this comprehensive report. For example, it was found that when apples are budded early (end of July) with subsequent rapid growth of the rootstock the growth of maiden trees in the following season is often delayed mainly because of the constriction of the buds by the tie. Ties should be released before they are too tight or use made of elastic or other ties that will give way.

Among the Bulletins intended for fruit growers, one includes a very interesting account of methods used in France and the Rhineland for protecting fruit from frost, and another deals with progress in research on the control of disease in fruit crops and hops.

A large underground root observation laboratory has been completed at the Station. Some progress is being made on the breeding of spineless gooseberries.

The full text of the Amos Memorial Lecture, by Professor G. E. Blackman, is given. It deals with the effect of the area shape and arrangement of the leaves of different plants on their productivity and provides some interesting explanations for the behaviour of both agricultural and horticultural crops in the field.

In experiments on the control of apple mildew, it was found that spraying in December with DNOC petroleum emulsion was more effective than spraying at bud-swelling. Spring applications retarded bud development whilst winter applications accelerated it.

Copies of the report are obtainable from the Station. *A.J.L.L.*

Grass Farming. M. MCG. COOPER. Dairy Farmer Books. 30*s.*

A book by Professor Cooper on this subject can be expected to be both authoritative and written with the conviction that British farming will be prosperous in proportion to the use made of its grassland.

In this country grasslands vary widely in quality; they are differentially fertilized and used to produce milk, meat and wool. Farms also differ in size and in the relative importance of grass to other crops. The author begins by discussing how all these factors will have a bearing on the appropriate management of grassland, the intensity with which it may be exploited and the animals by which this may be done.

The hallmark of the book is the very skilful exposition of the 'why' and 'how' of integrating techniques of grass production with those of pasture use and livestock management to produce an efficient system. It is also made clear that, however good a technique may appear, unless it can be properly integrated into practice it will be of negligible value.

In those chapters dealing with methods of grass production and management, careful consideration is therefore given to their merits according to the circumstances in which they will operate. Leys and permanent grass, clover and nitrogen, and grazing management are all considered in this light.

Such critical evaluation of grassland techniques is an effective means of dealing with those topics that too often become subjects of controversy.

Professor Cooper points out that a too-rigid acceptance of three [illegible] can lead to a high proportion of a grass farm being temporarily out of production because it is in the process of being ploughed out and [illegible] rightly stresses that permanent grass well farmed, is not inferior in production to leys, although the latter may be more flexible in management. However, dealing with the improvement of permanent pastures, he is of the opinion that, owing to their poor condition, a large proportion of them should be ploughed, resown with good species and thereafter well managed.

The subjects of pasture utilization, the role of nitrogen and Italian ryegrass in extending the grazing season, controlled grazing and the conservation of grass as hay and silage are superbly discussed. The two chapters on the management of the ewe flock on grass and the creep-grazing of lambs are extremely valuable now that profitable ways of using grass, other than by the dairy cow, are becoming increasingly necessary.

Finally, there is a description of three intensively-managed dairy farms. Professor Cooper, in the preface, thanks these three farmers, for they, and others like them, have provided the inspiration for the book. This extremely competent exposition of grass farming is highly readable and will surely inspire many more farmers into ways of increasing their profits from grassland.

T.E.W.

Weed Destruction. STANLEY A. EVANS. Blackwell. 27*s.* 6*d.*

Full of information that should be helpful to students or farmers who have weed problems, this book has realized the need for order and simplicity in what could be a very complicated subject.

The author has been engaged full-time for some years in keeping abreast of modern methods of weed destruction, and at the same time he has been required to communicate his knowledge to others.

Attention is quickly drawn to weed problems, and to the difference in the behaviour and life patterns of various weeds. The need to identify the weeds while they are young is stressed, and is supported by description and illustrations. There is a chapter on the cultural control of weeds, and several which, with clear tables and diagrams, sort out the complicated story of what chemicals are available, how they work, and how they may be used for weed destruction in varying circumstances.

Details of the basic chemicals are given, together with the trade names and manu[illegible]rers of herbicide products approved [illegible]e Agricultural Chemicals Approval [illegible]Advice on the application of weed-[illegible] included, plus information about [illegible] machines and spraying, and tables [illegible]nce on correct mixing and applica-[illegible]

[illegible]nd half of the book gives specific [illegible]bout cultural and chemical [illegible]in arable crops and grassland. [illegible]tain crops are dealt with individually, and [illegible]ue regard is paid to the selection and timely application of the most suitable herbicides, according to the weeds present and the crop concerned.

No doubt new chemicals and new methods will be found to deal with some weeds, but the book is up to date and combines a fund of basic information with practical guidance in a simple manner.

A glossary of terms and a list of the botanical names of the more common or important weeds is included.

J.N.S.

Rural Settlement and Land Use. MICHAEL CHISHOLM. Hutchinson University Library. 12*s.* 6*d.*

The fields of study lying between related branches of instruction are not, as a rule, cultivated very intensively, although when this is done some handsome returns can often be secured. This stimulating book is a case in point. Written by an economic geographer, it is developed from a course of lectures given in connection with the Diploma in Agricultural Economics at Oxford. Some 'cross-fertilization' of these two subjects is long overdue, and the introduction of a clearer concept of a real differentiation into agricultural economics, and of simple economic principles into agricultural geography, can do nothing but good.

It is the sub-title of the book—*An Essay in Location*—which gives perhaps the real clue to its contents. Certain theories or ideas, which are basic to the analysis of rural land-use patterns, are examined at the outset and assessed for their relevance to conditions in the real world. This review leads on to the development of the main theme, which is the effect of distance on the location of agricultural activity and land

use. Distance is considered not only on a large scale in terms of the relationship between the farming region, its transport facilities and the markets for its produce, but also on the much smaller scale of distance from the farmstead or village to its individual fields and the sources of its essential supplies. Finally, the results and implications of technical change are discussed.

The general argument is well supported by evidence and specific examples drawn from many parts of the world, and the statistical material used in this connection is made comparable throughout by expressing all figures in metric units. One of the outstanding features, in fact, is the use of a quantitative approach whenever possible in place of the rather vague, qualitative treatments which so often pass for economic geography.

The book is a serious contribution towards a more scientific approach in this field of learning and deserves to be read widely and studied carefully. With the new light it throws on many facets of rural land use it should become required reading for all students of agriculture and geography—and for their teachers as well.

R.H.B.

Veterinary Dietetics. J. O. L. KING. Baillière, Tindall and Cox. 30*s*.

Perhaps the outstanding feature of this book is that it is a monograph on animal nutrition in which information is presented in a simple, precise and definite manner. The approach is novel also in that the emphasis is on nutrition in relation to animal health. The various aspects of dietetics are dealt with briefly, but the subject is nevertheless covered comprehensively in an incisive manner.

The book deals first with the basic principles of animal nutrition, and chapters follow on the deficiency diseases and common nutritional errors encountered in the practical feeding of the various species of farm animals and of dogs and cats. Later sections are concerned with nutritional factors affecting reproduction, the use of antibiotics and other food supplements, poisonous foods, and infections which can be transmitted by water and food. Finally, there is a very useful chapter on the nutrition of sick and orphaned animals.

Dr. King has obviously considered the various methods of expressing nutritional values and avoids lengthy discussions and confusion by using only the few which, in the light of his expert knowledge, he judges to be the most useful. Instead of making lengthy comparisons of the views of different authorities, he makes definite recommendations. While everyone may not agree with all he says, there is no doubt that he has succeeded in presenting a mass of extremely useful data which is up to date and refreshingly clear. It is perhaps a pity that tables of composition of feedingstuffs have been omitted, since their inclusion would have been both logical and useful to the readers.

This book is certainly well and clearly written, full of expert knowledge and is a welcome addition to the literature on animal nutrition. It can be recommended for all veterinary surgeons and students of veterinary science and will also be a handy guide to agricultural students, farmers, advisers and feedingstuffs manufacturers.

J.S.S.I.

Agricultural Sir John. ROSALIND MITCHISON. Bles. 35*s*.

In many ways Sir John Sinclair of Ulbster (1754–1835), typified the men who led the Agricultural Revolution. He was landlord, farmer and politician; he served the cause of 'agriculture and internal improvement' by precept and example; and, like so many others in that enthusiastic age, he wrote interminably on any subject that happened to take his fancy. But in one way he was conspicuously ahead of his time; he had a passion for 'useful information', by which he meant the detailed, systematic knowledge required for political decisions. It is significant that he is best remembered as the principal founder and president of the Old Board of Agriculture, the first publicly-financed research and information bureau in our history. It is even more significant that he introduced the word *statistics* to our language and that his most substantial book was *A Statistical Account of Scotland.*

Yet this was promise, not performance, for his career illustrated the weakness as well as the strength of the amateur tradition he represented. Too much depended on individuals, too little on institutions, and the energies which he so cheerfully dissipated on such an astonishing variety of interests were more obvious than his final public achievements. His Board was dissolved in 1822, and it was not until a generation after his death that the agricultural returns gave the first accurate account of the acreage, crops and livestock of the country.

Mrs. Mitchison's definitive life of this interesting and versatile man necessarily includes much of the agricultural history of

the period. In particular, her account of Scottish developments provides a valuable corrective to that over-simplified picture of the Agricultural Revolution which it is so easy to form and so convenient to accept, while her description of the Board at work illustrates in agreeable detail many of the conditions and ideas of the time. More generally, the glimpses she gives of practical politics in the later eighteenth century are a delight.

This is a sound professional biography by the first historian to be given access to Sinclair's private papers. But it is written with system and scholarship rather than inspiration and is gravely weakened by lack of agricultural insight. For example, there is no reference to such concessions as the reward paid to Joseph Elkington for the disclosure and publication of his system of land drainage, the removal of taxation on drainage tiles and the abolition of the duty on American oilcake, which were all secured from Parliament on the recommendation of the Board when Sinclair was president. Yet it is the assessment of this kind of service to the farming interest that determines judgment on his effectiveness as an agricultural politician.

The book would have been greatly improved by a bibliography of sources and a chronological list of Sinclair's publications. *N.H.*

Weed Control in Herbage Seed Crops.

The latest leaflet (Herbage S.G.L. No. 6) issued by the National Institute of Agricultural Botany in their series for herbage seed growers outlines the weed problems in herbage seed crops and summarizes the stages, from choice of field to seed harvest, when attention should be given to weed control. It reviews the current information on herbicide treatment and deals fully with the special points relating to herbage seed crops, including grass weeds.

Copies may be obtained by sending a stamped addressed foolscap envelope to the Secretary, National Institute of Agricultural Botany, Huntingdon Road, Cambridge. *L.C.G.*

ACKNOWLEDGMENT OF PHOTOGRAPHS

We gratefully acknowledge the loan of photographs as follows:

p. 155. Eagle Photos; p. 156. *Farmer and Stockbreeder*; p. 160. F. A. Standen; p. 162. Firth, Cleveland Ltd.; p. 163. Rotary Hoes; p. 165. Farmers Guardian; p. 167. H. G. Clarke; p. 170. Stearn; p. 172. C. W. Hulin; p. 177. *Farmer and Stockbreeder*; p. 179. Arthur Hosier; p. 181. National Institute of Agricultural Botany; p. 185. J. Hardman.

AGRICULTURE

Price 1s. net monthly (by post 1s. 4d.).

Subscription Rates (including postage):

Home and Commonwealth: 14s. per annum. Foreign Countries 15s. per annum

Subscriptions may start with any issue and should be sent to:

HER MAJESTY'S STATIONERY OFFICE

York House, Kingsway, London W.C.2
13a Castle Street, Edinburgh 2
39 King Street, Manchester 2
35 Smallbrook, Ringwood, Birmingham 5
423 Oxford Street, London W.1
109 St. Mary Street, Cardiff
1 Tower Lane, Bristol 1
80 Chichester Street, Belfast

Single copies can be purchased from any of the above-mentioned addresses or through a bookseller, price 1s.

Printed in England under the authority of Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, Yorks.

(K77) 72-1-62-7

Regular monthly tests for solids begin in two months' time.
Upon these will be based the bonuses or penalties of the following year.

Next year's bonus is earned now!

Steaming-up

It's a pity there is so much lip service to steaming-up and so little positive action, since a planned programme of steaming-up not only produces higher quality milk but actually costs less than makeshift methods.

Dry off the cows at least six weeks before calving and let them have the best grass the farm affords—don't turn them out on poor grazing to fend for themselves. Feed a complete and balanced dairy cake to give them every opportunity of repairing the wear and tear of previous lactations and of renewing their tissues for the next.

Although in the natural order of things the solids content falls as the cow ages, the science of nutrition can help to direct and control nature. If you have any doubts on that score get hold of the Silcock handbook on steaming-up, apply the recommendations conscientiously and compare the results—both in quantity as well as quality—with those from the same cows last year. You will be delighted. You will also be relieved of anxiety on the score of quality next autumn !

SILCOCKS PROVEN HIGH YIELD LOW-COST PLAN

SILCOCKS

R. Silcock & Sons Ltd., Stanley Hall, Liverpool 3

OFFICIAL APPOINTMENTS

PUBLIC SERVICES OF NIGERIA

Applications are invited from suitably qualified candidates for appointment to the following posts in the Public Services of Nigeria:

Appointments are on contract for two tours of 12/18 months each in the first instance, renewable on mutual agreement.

1. CHIEF AGRICULTURAL RESEARCH OFFICER. (Western Nigeria).

To be responsible for the organisation and development of the Research Division of the Ministry of Agriculture and the Natural Resources.

Qualifications: An Honours Degree in Natural Science or Agricultural Science with considerable research experience in tropical agriculture. Applicants should have shown aptitude for direction of research.

Salary: Fixed at £2,748 p.a. plus gratuity of £150 p.a.

2. AGRICULTURAL OFFICER, FIELD EXPERIMENTATION (Western Nigeria).

Qualifications: A degree in Agriculture plus two years' post-graduate training, preferably with emphasis on the technique of field experimentation.

Salary: According to experience in the range of £1,200 to £2,160 p.a., plus gratuity of £150 p a.

3. AGRICULTURAL ENGINEER. (Northern Nigeria).

Qualifications: An Engineering Degree with a Diploma in Agriculture or a degree in Agriculture with a Diploma in Agricultural Engineering, Associate Membership of the Institution of Mechanical Engineers with Agricultural experience will be accepted.

Salary: According to experience in the range of £1,440 to £2,202 p.a., plus a gratuity of £150 p.a.

4. PRINCIPAL VETERINARY RESEARCH OFFICER (Federal).

Qualifications: Membership of the Royal College of Veterinary Surgeons or equivalent qualification.

Salary: Fixed at £2,532 p.a., plus gratuity of £150 p.a.

Write stating brief details of age, qualifications and experience and additional information to the Government of your choice as follows:

1 and 2: The Official Secretary (Recruitment Branch), Office of the Agent-General for Western Nigeria, 178-202, Great Portland Street, London, W.1.

3. Recruitment Officer, Office of the Agent-General for Northern Nigeria, 9, Northumberland Avenue, London, W.C.2.

4. Recruitment Attache, Nigeria High Commission, 9, Northumberland Avenue, London, W.C.2.

UNIVERSITY OF QUEENSLAND

The University proposes to introduce in 1963 a programme of teaching and research in the field of Tropical Agriculture. Two Lectureships will be established at Innisfail in North Queensland and the University invites applications for these positions.

LECTURER IN AGRICULTURE (Tropical Agronomy)

Applicants should have a University degree preferably a higher degree with experience in Tropical Agronomy. The Lecturer who will be located at Innisfail in North Queensland will organise and develop a teaching and research programme into Tropical Agronomy. The teaching field will deal with the Botany of agricultural crops, pastures and weeds; the maintenance of fertility in tropical soils; preparation of the land culture and harvesting of tropical crops (incouding fruit and vegetables); weed control; the establishment, management and utilisation of tropical pastures; agricultural machinery and irrigation.

LECTURER IN AGRICULTURE (Animal Husbandry)

Applicants should have a University degree preferably a higher degree with experience in Animal Husbandry. The Lecturer who will be located at Innisfail in North Queensland will organise and develop a teaching and research programme into Animal Husbandry. The teaching field is entitled "Farm Animal Nutrition and Production" and includes Animal Nutrition, Physiology, Dairy Production and Animal Management insofar as they apply to tropical areas. Emphasis in the field of nutrition will be on the utilisation of natural and improved tropical pastures and of the by-products of the sugar cane industry.

The salary range for Lecturer is £A1830-6x90, 1x80-£A2450 and in addition a northern allowance of £A30 per annum will be payable.

The successful applicants will be entitled to participate in the benefits available to the academic staff of the University of Queensland which include F.S.S.U. type Superannuation, Housing Assistance, Study Leave and Travel Grants.

Additional information on the conditions of appointment, staffing and activities of the Department, together with application forms will be supplied upon request to the Secretary, Association of Universities of the British Commonwealth (Branch Office), Marlborough House, Pall Mall, London, S.W.1.

Applications close in London and Brisbane on *31st July, 1962.*

NIGERIA

Applications are invited from suitably qualified candidates for the post of

PRINCIPAL SCIENTIFIC OFFICER

Federal Ministry of Commerce and Industry, Lagos.

Candidates must possess a good Honours degree in Zoology, with post-graduate research experience in Entomology. Five years' experience of scientific research desirable.

Salary fixed at £2,532 p.a. (including Inducement Addition). The appointment will be on contract for one tour of 12-18 months in the first instance, with prospect of extension.

Write for application forms and further particulars, stating briefly age, qualifications and experience, to the Recruitment Attache, Nigeria High Commission, 9 Northumberland Avenue, London, W.C.2, quoting reference E.18/C.3325/6.

NIGERIA

VACANCY FOR SPECIALIST OFFICER (PLANT BREEDER)

Applications are invited from suitably qualified candidates for appointment as Specialist Officer (Plant Breeder) in the Department of Agricultural Research of the Federal Ministry of Economic Development. Appointment will be on contract for 2 tours of 18-24 months each in the first instance.

Qualifications: First or Second Class Honours degree in Natural Science (Botany) or Applied Science (Agricultural Botany) plus two years' post-graduate experience or training in plant breeding.

Successful candidate would be required to carry out research on plant breeding with special reference to Kola.

Salary: According to experience in the range £1,434—£2,196 p.a. plus gratuity of £150 p.a. One incremental credit for each year's approved experience in excess of the 2 years post graduate work.

Write for application forms and further details (women candidates need not apply) stating briefly age, qualifications and experience, to the Recruitment Attache, Nigeria High Commission, 9, Northumberland Avenue, London, W.C.2., quoting Ref.: B/C.3205/6.

Ministry of Agriculture, Fisheries and Food

Experimental Husbandry

Gives accounts of husbandry experiments carried out at both experimental husbandry and commercial farms throughout the country. It should have a wide appeal for farmers, their advisers, research workers and students. **5s. 6d.** (*post 6d.*)

Experimental Horticulture

Designed for commercial growers of fruit, flowers, vegetables and crops under glass, this publication contains accounts of experimental work and its bearing on practical problems in the field. **5s.** (*post 5d.*)

Publication of both these periodicals is irregular (*about two or three times a year*)

Obtainable from

HER MAJESTY'S STATIONERY OFFICE

or through any bookseller

ICI call this a spade

What else? ICI mean business. Their fertilizers make the most of your land—give you higher yields at lower costs. They are an integral part of modern farming economy. Put them in the seed-beds, top-dress the crops with them. There are ICI fertilizers for every type of crop, for every type of soil. Each different in its plant food proportions—all designed to produce bigger profits for you.

RELY ON ICI

'NITRO-CHALK' 21
SULPHATE OF AMMONIA
'KAYNITRO'
ICI NO. 1 (CCF)
ICI NO. 1 WITH ALDRIN
ICI NO. 3
ICI NO. 4 (HIGH-N CF)